

# **THE MEMETIC WORLD: The evolution of information, and the origin of man, mind, behavior and society**

{other possible titles

THE MEMETIC WORLD: What make us human

THE MEMETIC WORLD: And the Creative Human Mind

human nature

the memetic age

the information age

the informational world: the birth of human civilization

why the world is the way it is: memetic evolution

why we act the way we do: sociomemeology

**The memetic world: The (continual) evolution of information**

The memetic world: The evolution of information and the origin of humanity

the memetic world we live in

The memetic world: The continual evolution of information, products, services and technology, and the basis and origin of human behavior

memes: origins and goals of humanity

memes: the origin of the non-biological world we live in

memes: the basis of the human condition

The human race and the evolution of information

memes: a new purpose for human life

Memes Make the World go Around

the human condition

the informational world

THE PURPOSE OF LIFE

THE MEANING OF LIFE

The selfish gene, the selfish meme, and the selfish self}

## **Preface**

This book was inspired after reading Susan Blackmore's book The Meme Machine. Her book awoke me to the fact that much of what exists around us, much of what we do, and how we act, is driven by another system that evolves (almost) just like genes do. This system involves the transmission of ideas between humans, called memes. Memes evolve because they have the three basic ingredients for an evolutionary system: replication, mutation and selection of the fittest and best ideas. Everything around us that does not have a simple biological purpose or reason for existence has evolved (and is still evolving) in this way. This includes simple things like the chair I am sitting on, the computer I am using to type this manuscript on, the very language I am using to write this book, the shoes on my feet, my house (and the very bricks it is made of), my car, and the complicated legal and financial systems we have to live with.

When I first came across memes, I was working on my first book "Memory and Dreams: The Creative Human Mind", where I was suggesting that the way that the brain generates new ideas, thinks, plans, and functions autonomously (that is, in an unsupervised manner) was through so-called spurious memories. Spurious memories are internal 'memory' states not formally acquired or stored in the brain which result from the distributed overlapping storage of memories in common areas. Spurious

memories essentially combine features of stored memories in all sorts of combinations and this is how the brain generates creative ideas and prepares itself for new learning. I came to realize that these states are also how memetic mutations actually take place, without which there can be no memetic evolution.

Once I was alluded to memes, I started to look at everything around me finding explanations in terms of memes. Much of this book details my observations and thoughts on these matters, building from Blackmore's book. This includes the way society is structured and works, and the way we act. All of these things can be explained simply in terms of memetic evolution and the desire to copy each other and to spread information.

Memes also explain why we are so different to other animals; why we speak for example (whereas other animals do not), why we have belief systems, and in particular, why we believe we have self-awareness and free-will (or, that is, a mind), even if it scientifically appears to be just an illusion. Memes also offer a new understanding of the purpose of our lives, which let's face it is no longer that closely related to biology, as many people do not have any children today, and genes have essentially stopped evolving (as we manipulate them with memes/ideas and we prolong the lives and generations of the genetically weak). According to meme theory, our main purpose today is to try to spread our ideas (memes) as widely as possible, and not our genes. This is why many people strive to be famous (so that their ideas will be heard) and why we often put our careers (and self-indulgence) ahead of our own families. Once you have truly appreciated the meme idea you will come to realise how profound (but yet so obvious) it is, and you will wonder, as I have done, why it has taken us so long to realize that there is such a simple explanation of why things around us are the way they are, and why we act the way we do. You will also see the world, and what makes it go round, and yourself in a completely new light. In short, meme theory offers a semi-scientific non-religious explanation of life.

There is much that I say in this book that may have been said by others (as I do not read as much as I should), and hopefully much that has not been said as well. I am also not that well read in psychology and sociology, yet I feel compelled to communicate my own thoughts on these matters to others. In some places I may repeat things that have already been said by Blackmore, and others without giving proper reference to her or others. This has not been done deliberately. At times I lost track of what I had copied, or learnt, from others and what I had generated, or mutated, in my own brain. Where this is the case I take no credit for what I have said, but accept complete responsibility everywhere else.

This book has been written for a general audience and its main goal is to spread the meme meme as far as possible.

I would like to thank many people, my family, my students, my friends, my colleagues, and some people whom I may have only met briefly somewhere like at a

party, in a restaurant, in a bar, on the street, on the train, or at my university, who have listened to me ramble on about memes and how they can explain the way the world is and works. My efforts to convince them has helped me to refine my ideas and hopefully present them in a coherent manner. I have also learnt a lot from listening to them as well. Finally, I feel deeply privileged to live in a society that allows me to be a scientist, whose goals are to try to discover what makes the physical, mental and social world the way it is. One may well wonder why it is that we have evolved to allow people like myself to be afforded the luxury to just think and comment about the world, while the rest of the world in a sense takes care of us. The only explanation that I can come up with for this extraordinary situation is based on memes. People thrive on information and society encourages creativity and the discovery of new facts. In this case I thank memes for giving me this opportunity to write about memes themselves.

## 1. Introduction

If you look around, you will see that there are many things, like tables, chairs, buildings, shoes, televisions, and stereo systems (to name just a few) which do not have a clear biological reason for their existence. Why and how have these things evolved? If you observe people you will also see that they all act in some peculiar ways that defy biological survival (such as freely sharing information and helping others, sometimes to their own detriment). You will also notice that people copy each other to the point of absurdity, such as all trying to look slim, wearing the latest fashionable clothes, sporting similar haircuts, using mobile phones. They also act in a similar manner and have similar beliefs. Why is this?

There is a reason behind all of these things, and it is based on an entity called a 'meme'. A meme is something that we (generally) transmit between humans, like an idea or a piece of knowledge. The important thing about memes is that copies are made. If someone likes what we tell them, they will tell others, or if they like what they see (like the way we wear our hair) they will copy us. These transmissions are also subject to slight variations (a bit like Chinese whispers), so mutations take place. And finally the best ideas or memes survive longest. There is one other entity which behaves in this way, and that is genes. Genes make copies of themselves (reproduction), they mutate a little in this process (errors are made occasionally), and the fittest genes (or expressions of those genes) survive. This is the basis of biological evolution and explains the biological complexity of the world and the various species of plants and animals that exist, with some extraordinary abilities. The question then is what has evolved from memes, and the answer is everything around you that does not have a simple biological explanation. We will see that evolving memes are responsible for all of the non-biological world around us, the physical features (like buildings and bridges), the gadgets we use (like cars, dishwashers and tools), the financial system (like business, money, occupations and the stock market), the social, cultural legal and political systems, the way we act, the things we believe in, why things are constantly changing, and to some extent the way we think (except for so called spurious memories which are nonetheless combinations of memes)

In 1976, Richard Dawkins, in his acclaimed book "The selfish gene" introduced the notion of a meme, which is something that we transmit to, and imitate from, others. Dawkins suggested that this simple system, of information transfer, may itself evolve just like genes do, as he noted that memes have the three basic requirements of an evolutionary system. This idea has been further developed by Dennett (1995), Blackmore (1999), and others and has recently been proposed as a theory of the human mind and human behavior (sociology). Blackmore (1999) has also suggested that memes may explain why we humans have such a large brain, why we are mentally so different to other mammals, why we have sophisticated languages and why we are deluded to thinking that there is a self, a soul, or a little person inside of us, looking out at the world and making decisions for us. Meme theory has profound

implications for psychology and sociology.

Memes were originally defined as things that we copy and imitate from others, but should be broadened also include any information transferred between human, humans and recording devices (like books, compact disc and the Internet), and even possibly between machines, like computers, as well.

Everything around us evolves. There is little question of that. What meme theory suggests is that this evolution is driven by the exchange of information between humans, the errors they make in the copying and transmitting of information, and our extraordinary ability to create new ideas.

A nice analogy can be made with biology in that the human brain carries memetic information, in much the same way that DNA carries genetic information. This is why Blackmore refers to the human brain as a 'meme machine'. The analogy is quite intriguing because one can also view some of the things that we copy from each other, such as fashion, as viruses of the mind. These ideas attach themselves to brains, and jump from one brain to the next, in much the same way that real viruses attach themselves to DNA, and spread from one DNA molecule to another, sometimes even lying dormant for long periods of time before resurfacing.

The theory of memetic evolution is based on the fact that humans freely exchange and copy ideas from each other. We copy each other so much so that we even do so subconsciously (some examples of this, like yawning, are given later). No other animal is able to copy to the extent that we do, and this has led Blackmore to suggest that this may explain why our brains are comparatively so much bigger than other animals, for our size. As Blackmore points out if you smile at a dog it does not smile back at you (although it may wag its tail) but if you smile at a baby it smiles right back at you. Animals copy very little from each other, compared to humans. Birds may copy songs, and some gorillas may copy how to eat ants from a stick, but this does not compare to the amount of copying that we do. We copy language, mannerisms, ideas, beliefs, live styles, songs, and fashion just to name a few. We are complex and sophisticated copying machines. Blackmore suggests that we developed a large brain so that we could copy. Originally we had to copy in order to survive in a biological world. There was an advantage to be able to copy other people's weapons, tools, methods of food cultivation, and ways to dress and construct shelter. This led to a biological pressure to select those with the copying ability. Originally the copying of others and the exchange of ideas would have given us a biological survival advantage, but eventually we started to copy for the sake of copying itself, and memes started to evolve in their own right, quite distinct from genes. We now need to copy others to survive in a memetic world.

The fact that we copy each other is apparent when we note that almost everything we know, almost everything we do, and almost everything we believe in, we learnt from someone else. Either someone showed us, we read it somewhere, we copied someone, or we were influenced by someone. The way we talk, write, read, draw, think, do arithmetic, argue, go about our lives, and even ride a bicycle, have all developed and are passed on in this way. We learn things from our family, friends, work-mates, teachers, neighbours, people we meet, from books, newspapers, magazines, scientific journals, television, radio, and the Internet. We thrive on knowledge and the spread of information. (Just look at the amount of time we spend watching television and reading books and magazines.) Of course there are some things we do which are not copied, which we

generate ourselves (see discussion below on creativity), but if you stop and think about it, most of what you know you learnt or acquired from others.

The evolution of memes has also explains why we are so different to other mammals, why we have language (whereas other animals only have primitive forms of communication), why we have an insatiable appetite for knowledge, why we freely associate and communicate with other human beings (and talk so much), why we act in certain peculiar ways (such as engage in esoteric things like playing chess and doing mathematics), why we help each other so much (defying biological survival), why we are inquisitive (and think so much about things that have little biological relevance). Memes may also explain why we think there is a little person inside our heads (a self) who controls our actions, and why there may not be many other species similar to us, which one expects there to be if biologists are to be believed. Language for example allows us to freely exchange information, aiding the spread of memes, so we may have evolved this characteristic for this purpose. Memetic evolution has also resulted in our various cultures, languages, and religious beliefs, our legal, financial and political systems, technology, science and medicine.

One of the main reasons why we copy each other is that we have much to gain by doing so. We can use previously acquired knowledge, tricks, gadgets and ideas to make our lives simpler, better, safer, and richer for ourselves and for our children. So, why not use something that someone else has invented for us. Without such transmissions of knowledge, we would have to practically re-invent the wheel by ourselves every time we are born, and there would be no human culture. In this regard we have an enormous advantage over other animals.

As noted earlier, the spread of memes probably had its birth in the cave days when Homo Sapiens, and other related species, copied each other to increase their chances of survival. Blackmore argues that this need to copy to survive may have exerted pressure on our gene pool to favor humans with the ability to imitate. The act of copying is regarded as a highly intelligent process that most animals are simply not that good at, except for a few trivial examples. She suggests that this may be why we have such a large brain, compared to other mammals. Other than this explanation, it is deeply puzzling to understand why we are physically like other mammals, with a similar brain structure (each with a cerebral cortex, hippocampus, thalamus, amygdala, and cerebellum for example) yet our mental capabilities are so different. Although some animals do copy each other and demonstrate cooperative behaviors, our capacity to copy and store information far exceeds the ability of other animals. One may well ask, if other intelligent mammals, like the chimpanzee, were allowed to evolve, would they evolve to be like us. Unfortunately this may now never happen as we are controlling the world and interfering (through our memes) with the natural evolution of other species.

At one time memes were unimportant, but once they were discovered by creative thought in some human minds (which we will see are naturally equip to do so), they had to be copied by everyone else. Originally knowledge was an advantage to our genetic survival but it is now crucial to our memetic survival. We need to know so many things, so many memes, such as how to speak, how to write, and how to make a

living. We also need to learn along the way some more trivial things that impact on our biological survival as well, such as how to cross the road (and not get run over), how to eat and what to eat (and what not to eat, such as poisons), how to take care of our health, and how to act responsibly. The fascinating aspect of memes is that, after awhile the copying of ideas for the survival purposes of the genes, may have been replaced by the survival needs of memes themselves, as they are also an evolving system. Once this spread of information began, it started to evolve in its own right. They developed, so to speak, their own selfish needs, the selfish meme, to coin a phrase from Dawkins. Why would we need to know and store so much information, if biology was the only driving force? The evolution of memes has resulted in our social structures, the technological revolution and our own psyche.

As we shall see later the evolution of memes is also closely linked with biology in that biological memes are favored over other memes. Examples of this are memes that involve for example sex and food. In many cases some aspects of human behavior are best explained by a combination of memes and biology.

The human mind is quite special, in that not only can we copy ideas, or memes, but it is also capable of demonstrating and transmitting (or communicate) ideas (through speech and the written word), but it can also manipulate ideas and generate new creative ideas which can be subsequently copied. This creative process is the engine behind memetic evolution, because without it there would be no mutation and hence no evolution. Later on in this book, we will explain in more detail how it is that the brain actually generates creative ideas. Basically they arise from the distributed overlapping storage of memories in the brain sharing common neurons and synapses. A consequence of this sharing is that the brain generates its own 'memory' states, which generally consist of combinations of features of stored memories. These so-called spurious memories, so named because they were originally considered to be a nuisance, are crucial for our ability to learn new information and to adapt to an ever-changing environment. Admittedly other animals have similar brains and hence spurious memories as well, but we are advantaged over them because we have a lot more information at our disposal (available from other people or books) and as we will see spurious memories and creative ideas are actually built up from knowledge itself.

We will also see how it is that memes are not only responsible for our extraordinary abilities, such as language, but may also explain why it is that we experience the sensation of self-consciousness, which gives us the feeling that we are in control of our own actions. We will see that there is however really no free will, and hence no self, that it is just an illusion, that may have been created for the benefit of memes themselves. The intriguing aspect of this is how does this illusion come about. We will suggest that it is perpetuated from parent to child, and the reason we do is so that our children not only carry our genes, but our memes as well.

We also look at the way the modern world, with its sophisticated financial system, its rich culture, its advanced technology, and our complicated legal, social and political systems, is structured and endeavor to explain how memetic evolution has lead to it. Society may have originally started through cooperation. People may have started sharing memes, but as more and more memes were discovered, it became impossible for one or even a handful of people to share their memes amongst themselves. People then had to specialize in occupations so that they could through the advent of money buy memes services and products from others.

Mememes also influence the way that we act socially. Most of us copy each other like crazy, whereas some people are more creative and feed the evolutionary system. We also examine how mememes influence relationships between people and why there are less marriages and more divorces today. One of the main conclusions is that females are more memetic whereas males are more biological. This simple fact seems to explain a lot of how males and females react.

Finally we conclude by speculating what the future may hold if memetic evolution continues unabated at the rate it has been evolving.



## 2. Types of memes?

A meme is not precisely defined, but is generally taken to be something, like a skill, a technique, a behaviour, or a useful idea that we can copied from someone else, such as how to make a fire, how to use tools, how to grow crops, how to read, how to speak, how to run a business, or just information or knowledge, generally. Memes are continually copied from person to person. These memes are supposed to evolve in much the same way that genes do. They have the three basic requirements for an evolutionary system (Blackmore 1999; Dawkins 1976). Like genes, memes can be copied from person to person (or reproduced in biological jargon); they can be varied during transmission (corresponding to mutation as the biological equivalent); and the best or fittest memes win over other memes (just as the best genes, or expressions of those genes, win over other genes).

As we will see later almost everything we know, do and all the products around us are either memes or expressions of those memes.

The things we copy and imitate from each other are called memes, named by Richard Dawkins after the Greek word 'mimeme', which means to imitate. Dawkins also chose this name because it rhymes with gene, the basic unit relating to biological evolution. The reason for this is that potentially memes also evolve. They satisfy the three basic requirements of an evolutionary system. Like genes, memes make lots of copies of themselves them (corresponding to reproduction in a biological system), they can be varied (corresponding to mutation) and the best, or fittest memes survive. Today however the transmission of memes is more than just imitation, as we simply transmit ideas that are not formally imitated.

Blackmore and Dawkins define memes as things that we imitate or copy off each other; ideas, behaviours, but in this book we have adopted a slightly wider definition that also allows memes to be just parcels of information, not necessarily restricted to things that we actually imitate. Memes are passed on from person to person, and from storage devices like books to people and vice versa. Blackmore for example rules out some examples of animal copying as being innate (that is, housed in the genes of the animal) instead of imitation, which is presumed to be something that is copied and is not passed on in the genes. We believe that these two systems are intertwined together and it is difficult to separate the two at times. The fact that some animals have the ability or neural hardware to copy certain things, like birds can copy songs, does not mean that what they copy is not a meme. It is however not crucial to the presented arguments as other animals do not copy to the extent that humans do. Humans also like to show each other how to do things. they recognise the need to copy and to encourage others to copy as well.

Blackmore and Dawkins define memes as things that we actually copy from each other, or imitate, such as behaviors, but in this book we have adopted a slightly wider definition so that memes also include more generally ideas and information, or just knowledge in general, not necessarily restricted to things that we actually imitate. Blackmore suggests that birds copying songs etceteras are not really memes, because this process is an inbuilt instinctive behaviour and is not really copied per se, but we believe that some part of it is, as some birds, like parrots, are able to copy human tunes and phrases.

The notion of a meme is best described by giving a few examples. How we do something, like chopping wood with an axe, or sweeping the floor, how we make something, like a cake, or a

wooden box, how we use tools; how we grow crops, how we groom ourselves, how we talk (referring to the language we use), how we think, songs, customs, superstitions, language, accents, sayings, the way we cut our hair, the clothes we wear, the houses we live in, the way we live, the way we act, the things we eat, the things we believe in (such as religion) are all memes. Songs are also memes. They are readily copied, and we sing them to ourselves and to others. Songs and music probably originally arose because people passed small tunes and stories to each other. Another meme we pass on regularly is dance moves. We even have classes where we learn them. Dancing may be so popular because they are sexy and so have a biological connection.

When one is first introduced to the concept of a meme, one tried to define them properly, but after awhile one comes to realize that almost everything is a meme or has a memetic component. Instead of asking what is a meme, one will start to ask what is not a meme.

Some things like language, customs, accents and slang (phrases and expression of speech) are expressions of evolving memes. They are developed over time and are the result of a prolonged memetic evolution in confined regions. They reside in the minds of people and are a stabilized patterns of memetic evolution that are propagated in a collective manner, oir that is many people to each one of us we live with. We have to learn the language of the regions we live in and we cannot help but to pick up slang, phrases and expressions of speech used by others. This alos expalins why we have many different languages and accents as they are local phenomenon that evolve separately in isolated regions and are spread to others living in that environment.

Some things like language and money are a commodity or necessity of/for memetic evolution.  
SOUNDS TERRIBLE-REWORD.

In fact, literally everything we do and everything we know are memes, and everything around us, that is human, such as our traditions (like celebrating christmas), our entire culture, our political and social systems, and our religious and spiritual beliefs are all memes or a combination of memes. Most of us rarely come up with a truly original idea. Most of what we know as individuals, we learnt from someone else. Even our legal and political systems, and science are giant conglomerations of memes, called memeplexes, that have evolved from the free exchange and collection of ideas (memes) spread by humans. Memeplexes are too large to be directly exchanged from person to person, but aspects of a memeplex are readily transferred.

Most memes seem to have some importance in our evolution and our behaviour. Some memes spread widely and have great importance to humanity, while others are not freely spread and are mostly irrelevant.

### Personal memes

Some memes are personal and are not readily spread to others. They may or may not have a biological importance to them. Such memes may be particularly useful for our own survival or advantage (sometimes at the expense of others), or just for our pleasure or happiness. Some examples are, how to grow certain crops, how to build something or fix something, how to cook something, how to make lots of money for ourselves (and for our family), and how to enhance our sexual pleasure. Some personal memes still manage to get copied because we may share some of

them with our kin and friends, and this could spread into the wider community. Some may also get copied because we may be seen by others.

In the early stages of development, going back to the cave days, memes may have been kept private to give families or communities a survival edge. Different family clans may have discovered certain tricks, to do with food gathering, hunting, making weapons and tools, cooking and food preservation that they did not share with other clans initially. Some of these memes would have been difficult to hide and eventually got copied into wider communities. It would be difficult to keep private something like cooking with fires, or weapon making, as sooner or later a weapon would finish up in the hands of one of your adversaries. Some personal memes still persist today, such as how to make money for your family, and how to run a business, but it is generally much harder to hide memes now.

The usefulness of knowledge and memes is relative. If everyone knows something it may not be that useful to us personally, as it no longer affords us an advantage over others. As we shall see below, some memes enable us to make a living. A plumber, for example, uses his knowledge and memes to make a living. Other memes are best kept private to give us an advantage. This does not necessarily have to be a survival edge either. It could be for memes or for our own pleasure. An example of this is that when I am doing my hydrotherapy walking up and down a two-way lane in the local swimming pool. The general rule is to stay on the left-hand side (as we drive on the left-hand side of the road in Australia). Whenever I get stuck behind someone walking much slower than me, I swap over to the other side and walk the other way. This gives me an advantage because I never get stuck behind someone who is walking slower than me. If everyone else knew about this little trick (meme) my advantage would be lost, as I would not be able to predict when other people may also change lanes. I could find that after I change lanes that someone else also decided to change lanes. Some rules are however best utilized by everyone. Walking in the pool with a few people would not be possible without a rule that everyone must walk on the left-hand side. The same applies to driving cars on the road.

### Memes for sharing

Some memes are freely shared and for good reason. Why would we share information that may give us the survival edge over others? Are our genes not in competition with others? If we all share memes with others we will be better off too. The memetic answer is for the good of the memes, but there is also a biological answer in that we share these things, because we get something back in return. No one is able to discover everything by himself and cope with all of the available memes and information. This sharing of information is aided today by storage in books and digital devices, and the ready transfer of information through the media and the Internet..

Most memes that are shared are shared within a family, but even in a family some memes are not shared. For example, grandmother may be reluctant to give away the full details of a favorite recipe because this may be one of the reasons her children and grandchildren keep visiting her.

Obviously the situation is much more complicated than straight memes, because cooperation and competition also come into play. Humans are also competing with other humans so they may share a lot of information with other humans but may reserve certain information for their families only. It doesn't pay to tell everyone everything you know, but if people think you are withholding too

much on them, they will not pass on information to you. There is great advantage to be more cooperative with others than to remain in complete isolation.

### Memes with a biological relevance

Some memes have a biological relevance, and influence survival. These memes would have been the initial driving force that exerted pressure for our mental evolution. Lack of certain knowledge, such as which poisonous plants not to eat, how to grow crops, hunt for food and make weapons, could have been perilous. Biologically important memes still exist today, such as knowing how to cross the road, to avoid taking drugs, how to use a knife, how to eat and what to eat, how to take care of our health, and how to survive, mentally and financially, in a complex world.

There must have come a time when humans started sharing memes with others not belonging to their genetic family. This could have occurred through observation, the mutual exchange of ideas, the formation of coalitions, or the necessity for social behavior. It may have been realized that there were benefits to share certain memes more widely, and to even help each other. Cooperation would have become necessary when there was too much to know and do as individuals and families. Today, we use accountants to file tax returns, doctors to prescribe medicines, bakers to get our bread, electricians to do our wiring, and builders to build houses for us, to name just a few. The need to cooperate and share information grows as the world continues to become more complicated. There must have been a profound moment in the evolution of our species when we started to cooperate, and help others of a different genetic makeup. Financial systems were invented to facilitate this process.

The sharing of information freely and doing things for others seems to violate the basic premise in evolutionary biology that we are in competition with others for survival of our own genes. We were competing with our fellow human for survival in a limited environment. Biology has identified a behavior, called altruism, which may benefit other creatures, even at the expense of the creature carrying out the action, but it is unlikely that altruism can explain the level of sharing that does take place. One can also suggest, as Blackmore does, that memes are the underlying basis of altruism.

Humans may have come to realize that sharing information or memes was for their mutual benefit for their survival, not just in the biological and physical world, but also in the memetic world. Eventually this led to the formation of societies with laws, which control what information is shared. Note that we may want to share some memes with others like which poisonous plants not to eat because we may not want to have dead bodies all over the place, as this increases the risk of disease. But how we know that dead bodies cause a disease in itself is a meme, and one can argue that there is a memetic and a biological origin for this type of behavior. Today information is shared widely with the advent of the written word, publishing, the media and the Internet.

Some memes are however still kept quite private, and some memes, like tricks of the trade, are not readily transmitted, as some people rely on them to make a living. This helps people survive biologically (that is live) and memetically, where by the latter we mean that they have a means to buy other memes or services.

Information important for survival is freely available today, but

'Memes' are still important in our current quest for survival but on a larger scale. Instead of involving families and communities, the memes that are important today are memes associated with whole countries. For example the inability of a country to survive against an epidemic, such as Acquired Immune Deficiency may render a population to dissolve or die off.

Non-biological memes (not necessarily useless-difficult to define useful/good)

There are also lots of everyday things that we do that do not have any survival. For example we mow lawns, we do things around the house that do not serve any such purpose. Why do we do such things? To impress others, but why? So that we are liked by them, so others envy us, so that they will copy us, or our memes. Memes offer a natural explanation for why we do things that expend energy but serve no biological survival need. If you stop and think about it, there are many many things that we do that are simply not necessary for survival.

Some memes have practically no biological usefulness, or so it seems, such as what fashion of clothes we wear, how we cut our hair (referring to style), what names we give to our children, how to play chess, and using a mobile phone. We have to be careful about making this statement because even some of these apparently non-biologically memes can be construed to have some biological relevance. Keeping up with fashions and grooming ourselves may help you to find a suitable partner with whom we can mate. But this would not explain why we would persist with these traits once we have passed our reproductive period, but the again some people tend to let themselves go a little once they have married and had children. Some fashionable memes, like using a mobile phone, cannot be construed as having any biological relevance, especially if almost everyone else has a mobile phone.

Why do some memes make it and some do not

There are memes which last for a long time, memes which spread like fire, and memes never make it. It is difficult to determine what makes memes successful, although biological influence seem to be important, and I dare say that we are figuring this out now through our advertising industry is figuring it out through evolution right now...

A meme does not have to be truthful (or correct) or useful to make it, as we have already noted in the case of religion. The biological attributes of sex, fear, food, etc certainly help certain memes do well, but some do well for no known reason and can last a long time as well, although their scope may be quite local, which means. My friend Liz Murphy told me that a daughter asked her Mum why they had to cut off the end of the ham before they baked it. The mother said that this is what is done. The girl asked her why and the mother had to think hard about it and say that she did not really know, that her mother did it. So the girl asked her grandmother about this and she said the same thing, that her mother told her to. Luckily the girl's great grandmother was alive. She asked her why they cut the end of the ham off before they bake it in the oven, and the great grandmothers said that they had to because it did not fit into the baking tray. This meme spread for no apparent reason and there was no need to still cut off the end of the ham now that baking trays were so much bigger.

Memes spread by grabbing human attention or interest. Blackmore suggests that they are competing for the limited amount of space in the human brain, but we believe that the capacity of the brain is almost limitless. The interesting thing about this is that if we are just memplexes, a collection of memes gathered on our life journey, then it is memes which decide if they will accept a new meme and propagate it further. And furthermore as we are all memplexes, with many memes (ideas and beliefs) in common many of us react in a similar way to a certain meme. This is because we have been conditioned to similar ideas, either from society in general or through the media. I believe that for a meme to spread it needs to be slightly creative, but not too creative. We thrive on new information. Old jokes do not interest us as much as new ones, and old news is not as interesting as new stuff. For a meme to be accepted however it should not be too creative or too different. This is because we all tend to go along with basically what we know and if something is too different it does not compute with our other memes. This is while some new scientific theories are met with much opposition when they first come out, and why outrageous fashions (as judged by the present standards) are not accepted. In short for a meme to have a chance of spreading, which means it captures our attention, it should stimulate us with its originality but it should not be exotic, and recall from what we said earlier, if something is too different we do not appreciate it with our brains. We can only appreciate something if we know something about it.

### Memes out of control

Other than a few memes, most of everything is available to all. Even information about careers and technical information is made available. It is quite surprising what you can find out if you search for it.

Today information is freely available in books, magazines, on television and on the Internet. If you want to really know about something, you can find out more than you can handle by looking up some of these sources. Literally trillions of man-hours of information are available for other people to utilize. Not everyone however makes use of this information, as most people are happy to just move along with others and copy each other without much need to seek new information as a means to generate new information and ideas.

### Memplexes

Memes also tend to group themselves into large collections of memes that mutually support each other, in much the same way that creatures stick together or form mutual alliances for their biological survival. These 'memplexes', or conglomerations of memes, naturally stay together and support each other in a competitive and hostile memetic environment. Examples of memplexes include songs on an album, a style of music, groups of similar tools, a scientific discipline, the legal and political systems, our laws (which are a collective consensus of public opinion), and the way we build houses. Memes that belong to groups have a better chance of survival, just as some creatures, of similar genetic makeup, seem to enhance their survival by staying or roaming around in groups or herds. Memplexes are not memes per se, because they are generally too large to be transmitted between two individuals. Humans maintain complex large memplexes by storing them in devices other than the human brain, such as in books, sound recordings, film, computers and on CDs. One could also argue that these sophisticated systems for recording, storing and transmitting information were invented for the benefit of the memes themselves. What biological reason could there be for their invention. These systems for storing information help humans maintain knowledge outside of the human mind. If they did not exist, and humans could only transmit 'small' amounts of information, the expanse of our knowledge would be much more limited than what it is today.

Science is a special type of memplex, as it can be used to test the validity and usefulness of other memes or ideas. Having said that though, there are memes which persist to exist and spread that are obvious riddled with untruths. The classic example is religion. As pointed out by Dawkins, religion survives because it is combined with threats like “if you don’t believe in God you will not go to heaven”, and the tautology that if anything does not make sense, it has to be taken on faith.

Gadgets, devices and appliances like washing machines and cars are memplexes. Cars, for example, are a collection of ideas or memes that are put together to create a device that enables people to travel around in comfort. As more and more new features are discovered, like independent suspension, air-bags, air-conditioners automated braking systems, these are added to the motor vehicle memplex and become standard accessories to the standard motor vehicle.

There are a lot of memes and memplexes know, but they are not accessible to everyone and no one person knows them all. Each person only has knowledge of a small part of what is known and different people are aware of different things. People generally communicate about the things that they know about and often help others learn about new things. People are generally compatible or friends if they have common memes or beliefs.

From what we have said above, almost everything seems to be a meme, or a collection of memes. Almost all of human culture can be argued to have resulted of the exchange, evolution and storage of memes. Even the human brain can be conceived to be giant memplex, a collection of things that we have copied or learned from others during our lifetime. The brain however, as we will see below, is however also equipped with the ability to generate its own memes or creative ideas, and there is also the question of free will. There are also certain things that we experience ourselves, which cannot be easily communicated to others, such as our emotions and pain. Although we may have some sympathy with what someone else is experiencing based on our own experiences we cannot directly communicate these feeling to others. Incidentally, the fact that we are unable to explain things like consciousness, may have something to do with the fact that consciousness is not a meme.

As we shall see below, Blackmore has made the extraordinary claim that the self is also a memplex. This would explain why science has been unable to identify and explain what it is. According to Blackmore, the self is an illusion created by memes for the benefit of memes. See discussion below. By the same token, emotions like happiness and love may have also been some memetic drive for their invention, as they allso benefit memes.

The human mind is special in that it is a memplex, a meme-transmitting machine, a meme-generating machine (creativity), and a meme-testing machine. The mind is basically a collection of interrelated memes that itself evolves and improves its position in relation to the environment and with respect society (or other minds). It competes for memetic (and biological) resources, just like creatures compete for biological resources. If the self was a real entity and not an illusion then one might also be tempted to suggest that in addition to a selfish gene and a selfish meme, there is a selfif self.

## Religion

One of the classic examples of a meme that spreads widely and has been around for a long time is religion. Dawkins gave religion as an example of a meme. One of the main reasons why religion is so widespread is that the religion meme is combined with both fear (you will go to hell if you disbelieve) and promises, and the church actively encourages parents to pass on the religion meme to their children. What is most surprising, as Dawkins and Blackmore note, is that religion is generally based on unfounded and illogical premises. The falsehoods of religion are generally accepted as truths, even if it is painfully obvious that they are nonsense (such as Moses made the rivers waters part so he could cross) is physically impossible. Contradictions in religion are generally, such as why would God let someone die, who was such a good worshiper are put down to testing one's faith. If not for memes, it is hard to imagine why religion would have spread to the extent that it has.



### 3. The Evolution of memes

In this chapter we will argue that memes evolve in much the same way as genes do, and that memes and genes coevolve, or that is evolve at the same time in a manner dependent on each other.

#### The principles of biological evolution

Biological evolution is fairly well understood in terms of Darwin's theory and the survival of the fittest genes in a competitive and changing environment. Actually what survives are not the fittest genes, but the individuals (also called the phenotypes), which are the expressions of genes. Our genes, which are the basis of our inheritance and our physical identity, are passed on to us by our parents, and on to our children by using long molecular structures called chromosomes, which are made of molecules of deoxyribonucleic acid (DNA). In humans there are 23 pairs of chromosomes, and each of these molecules consists of sequences of the four nucleotides (other chemicals) like adenine (A), guanine (G), cytosine (C) and thymine (T). Information about us and how our bodies should function are passed on by the precise sequences (actually of triplets) of these chemicals (such as GGATACTAGACGTGC....). Genes correspond to certain subsequences within these sequences, although some of the combinations and sequences do not carry any information and may simply act as breaks, stops or commas in the encoded information. Genes are thought to be responsible for producing the instructions on how to construct our bodies (such as our organs, the colour of our eyes, and our general physical appearance), how they should function, and how to manufacture specific proteins at the molecular level, which are essential for the function of our specialized cells. The human genome is thought to contain somewhere on the order of 10,000 to 100,000 active genes, more recently put at about 30,000 genes by the Human genome project (###possible ref###).

During reproduction, the genes from two parents are combined, with a little variation (also called mutation) and recombination (also called crossover), to produce an offspring which resemble both parents. Each offspring receives half of its genes from each parent. Mutation, which generally results from errors in the transmission of genetic information, is very rare in humans. Crossover refers to the rearrangement of whole sequences of nucleotide, like a cut and paste exercise, and in humans crossover generally occurs in each parent before chromosomes are combined together to form the offspring. Note that although an offspring may have the same genes as its parents, it can still have different characteristics from both parents, by a process called complementation. In humans, and most advanced organisms, chromosomes occur in pairs, and as mentioned above humans have 23 such pairs. There are two gene loci for each gene, one on each chromosome. If one parent has the allele pair combination BB and the other parent has bb, then the offspring can have bB, which is different. Generally one of the alleles, which is a name given to the actual values of a genes, is usually dominant while the other is recessive.

In standard evolutionary theory, individuals with the highest fitness, or the best survival characteristics (which is tantamount to saying that they best fit in with the environment, and this includes what other creatures are currently living and the physical environment) will survive to be able to reproduce. Individuals with the weakest characteristics will die off and will not reproduce, or will have limited capacity to reproduce. This mindless iterative process is thought to be the underlying process by which most, if not all, of our biological features have evolved. This is quite remarkable, considering that most animals have very advanced and complicated biological features, such as a visual system, the eyes, an auditory system, the ears, a sophisticated nervous system,

which includes the brain, legs and arms for mobility, not to mention some of the complicated molecular processes that go on in our bodies.

The size of the human brain, however, is a bit of an enigma, because it is difficult to see why our brain is comparatively so much bigger than the brains of other similar animals. Compared to the chimpanzee, regarded as our closest ancestor or relative, our brain is over three times bigger than what it should be, even after allowing for body weight. Also why is it that we have some highly specialized cognitive functions that other animals do not have? And why do we do certain things that have no clear biological need, such as talk to each other, play chess, listen to music or think about mathematics and science? As we will see below, the answer to this puzzle has been suggested to lie in the evolution of memes.

### Memes evolve too

Dawkins (1975) has argued that memes, like genes can evolve, since they have the three basic requirements for an evolutionary system: replication, variation and selection.

In biology, genes are replicated, and the vehicle for replication is the DNA molecule. In memetics (or informology, to give it a name), the meme is the unit that is copied and humans (or more appropriately human brains) are the vehicles for this replication. As we shall see the human brain is naturally designed not only to transmit memes, but to explore memes. This is why Blackmore coined the phrase 'meme machine' to describe the human brain's role in the proliferation of memes. In fact, memetics is the science of the transmission of information between human brains in particular, but also between human brains and other devices and the evolution of such systems.

The need for variation in evolution is quite clear, as this gives the system the capacity to produce stronger offspring, which are better suited to survive in an ever-changing environment. In biology, variation takes place through crossover, mutation, and sex (since we acquire half of our genes from either parent). In memetics, errors can occur in the transmission, reception, storage and retrieval of information. Messages can also be varied in someone's head before they are passed onto others and people may misinterpret a message. Memes can also be manipulated in computers, as a computer programme generally turns input information into new output information.

There are some suggestions that the amount of variation in memetics is too large to constitute an evolving system that improves itself, because with too much variation one loses the interesting constructs and features which have already evolved in the system. The evidence to the contrary is the fact that some of our technological advances do not seem to have a biological purpose and could only have arisen from the evolution of memes. There are also checks in the system that slow down the evolution of memes, as we will expand on later.

There are two ways in which memes can evolve. New ideas can be generated by ideas in one person's head, which then spreads into the community. This takes place because the human brain is naturally adept to generating new ideas, by combining memories and bits and pieces of information to generate new states. We will elaborate later on these memory states that the brain does indeed generate. They are a natural consequence of the way that memory is stored in the brain, in an overlapping fashion sharing common neurons and synapses. These internally generated memory

states, which we will discuss in depth later when we talk about creativity are called spurious memories in the literature because for most of the time since their discovery, researchers took the view that they were unwanted states of the mind, as they interfered with the recall of stored memory. In *Memory and Dreams* we took the view that these spurious memories are important for learning new information and that they are indeed the basis of creativity. More about this later.

Another way that new ideas can be generated is by accident as it were. This can arise if someone does not appreciate something they have seen or heard and imagine it to be something else, which may turn out to be an even better idea. It is a bit like Chinese whispers. If you tell someone something and get them to tell someone else, who tell someone else in turn, you will find that sooner or later the original message has changed quite dramatically. This distortion of memory plays an important role in generating new information, or memetic mutation. We believe however that distortion itself is closely linked with spurious memories, as spurious memories interfere with what we originally saw or were told. Instead of recalling the 'stored' memory we recall something a little different. In other words we have generated a new memory state because of the way that the brain works in an imprecise manner. This too can be a means for generating creative ideas.

The British psychologist Fredrick Bartlett (CHECK) did experiments in the 1930s where he told people stories or folklore, and then asked his subjects to repeat later what they had been told. Some would tell the story quite well, others would leave bits out, whereas some would add new bits to the story. Some would even change the whole context of the story and tell it from a completely different point of view. The same thing happens with jokes. I am often accused by my kids for adding too much extra information (or bullshit) to jokes I have heard. I believe however that I am adding more intrigue and wit to the jokes, or maybe I just don't remember certain things and fill it in with something else I make up. (Note that when I make things up I am using spurious memories.) I saw an interesting children's program on the television recently, where the presenter was trying to get the message across to his audience that memory is distorted. What they did was show a sketch of an owl with a hat to someone and then asked them to reproduce the drawing they had seen. The next person was shown what the first person drew and asked to draw later what they had seen. This new image thus generated was shown to another person. After about six or seven steps in this iterative process the final picture looked nothing like an owl but more like an abstract drawing with a few curves and lines. This is a good example of how memory distortion in the human mind can lead to mutation, but this example is not typical of how strong memes evolve. Too much variation will result in something that is no longer useful. Strong memes evolve with much less variation. An example of this is religion, where the basic story has not changed all that much, although I should add that a number of versions of the same story have stabilized themselves.

Selection is the process by which the fittest or strongest organisms are selected to survive, while the weakest individuals die off, or are reproduced with diminished capacity. In memetics, the best memes, such as the best songs, the best tricks, and the best ideas live on, while others die away, some do not even get off the ground. The question of what the fitness function is in either the biological or the memetic system is quite subtle and difficult to define. The fitness function is how well something fits in with everything else around it, with other memes. Popularity is also an important part on memeology, but it is difficult to ascertain what makes something popular, and then something could be popular and be spread widely, only to suddenly become unpopular, and vice versa.

The three most important factors which govern the rate and extent of the spread of genes and memes are fidelity, fecundity and longevity (Dawkins 1975).

Fidelity refers to the accuracy of the copying process. In biology errors are rare and there are even error-correcting molecular mechanisms which try to minimize the number of errors. Memes on the other hand are transmitted with much more errors. We often misconstrue what someone has shown us, do not recall it properly or do not pass it on to others correctly, or as it was shown to us. And even if we pass it on properly, the receiver may not grasp it properly. There are however memetic attributes which help to limit gross changes. For example, advances in science need to be consistent with all other scientific theories.

Fecundity refers to the number of copies made. The more copies that are made the better the survival chances of genes or memes. Humans do not generally produce many offspring, especially today (for which we will see later there is also a memetic explanation), and certainly not as many as some animals do. Memes on the other hand can be widely transmitted, particularly if the media, such as television, newspapers or the Internet are involved, and powerful memes generally have high fecundity. On the other hand, even with these means for widespread transmission, some memes only have a few copies produced and spread little.

Longevity refers to the amount of time that a piece of genetic or memetic information lasts. In humans, one half of our genes are passed onto our children, the other half come from the other parent. This means that eventually our genes are lost. On average any one of our great grandchildren, eight times over, will carry about one thousandth of our genes. Most of our genes will however be dispersed into the many offspring that our protégé have produced. The longevity of memes is much more varied, as some memes can last for a long time (such as religion, or the act of cooking meat before eating it), whereas some memes last for a shorter time (such as the use of vinyl records to record songs), and others memes last for only a few days or even less. Most memes probably only get transmitted a few times and die almost immediately

There is some controversy about whether memes are copied with sufficient fidelity (or preciseness) to constitute an evolutionary system. In a sense genes are digitized information, which are encoded as sequences of bases on DNA, whereas memes have more of an analog analogy, because they are less well defined and imprecisely copied. However, as we will see below, in more recent times, memes have invented digitized units for their successful transmission, such as computers and language (here the 'digitized' units of information transfer are words). Nevertheless memes are generally copied with much larger errors than what genes are, and genes also have error-correcting mechanisms. We believe however that inaccurate memes are corrected for by the environment of other memes, for example if a meme is clearly inappropriate or false it will be eliminated or modified, by us individually or by the human race as a group, based on other memes and knowledge already present in our heads or in the community as a whole. This is not always the case though, as is afforded by the example of religion, but this not to say that religion is not useful, as it helps make us into better people (excepting wars between different religions). almost everyone knows that the premises of religion are false but they accept them because they have been conditioned to, and religions seems to have answers for some things that are not really answers at all. For example, if someone who is very religious asks why something horrible happened to them, they would be told that the Lord is testing their faith. Religion is also maintained and propagated because it is closely linked with fear, and our quest for understanding. If you do not believe in God, you will go to hell and burn for eternity. This sort of threats are made to children at an early impressionable age and it is difficult to deprogram this after so many years of untruths and lies, mind you many children grow up to realize that religion is without real basis. Religion also does well because it provides a pretend 'answer' to our existence and to our future. many people are simply not capable of

understanding that we did evolve from the primordial sludge. They would prefer to believe that there must be a maker, a God, who created us, as it seems to them inconceivable that we might have evolved through natural selection.

The other problem with religion is that there are now laws in place to even protect people's religious beliefs. It is against the law to discriminate against one's religious beliefs no matter how absurd and crazy they may be. I am sure that even Christians and Catholics cringe at some of the other bizarre religions, but if one is to be fair they have as much right to exist as their own, as their basis for their beliefs are equally as unfounded. Incidentally, this conflict in religious beliefs is why we have so many wars. Another example of a meme that propagates but is clearly untrue is that of Santa Claus. This meme does well because there is mutual benefit to the child and to the parent. The child receives a gift from Santa and the parents rejoice in the pleasure expressed by their children.

In other words, what we are saying is that, memes can be corrected after transmission by what essentially amounts to their fitness function. See below for further discussion on this.

It is important to note that evolution is a blind and mindless process. There are no rules about what should or should not happen. As genes and memes evolve, how they fit in with their surrounding environment determines whether they will survive, propagate or die. In the process of evolution, every gene (and individual creature) or meme (and human mind) is striving to propagate itself further, sometimes at the expense of others, and sometimes for the benefit of others.. This is why Dawkins titled his famous book 'The Selfish Gene' and why we have borrowed from that title here, in calling this Chapter 'The Selfish Meme'. Note that the use of the word 'selfish' does not mean that the gene or meme is actually selfish, they have no feelings, but that they blindly evolve with the selfish 'agenda' of proliferating themselves.

It is hard to predict the outcome of memetic evolution just as it is hard to predict the outcome of genetic evolution. Who would have imagined that bats would develop sophisticated sonar systems to navigate at night and all of the other amazing features that plants and animals use to survive in their environment. I am always amazed when I watch one of those programs on television that looks at the way that some plants and animals function. The reason we cannot predict the outcome of these evolving systems is that they are what is mathematically termed to be chaotic. Even if we know the exact laws of evolution (or iteration in mathematical terms) we cannot always predict the outcome at some time in the future reasonably into the future. We will say more about these later. What is true however is that we may still be able to say broad things about how this evolution may function and we may be able to predict certain general properties about such systems and some of the things and features that may evolve, but what is generally true is that most things can only be determined in hindsight.

### Meme Pools

It is thought that genes with some commonality tend to support each other. Most animals and plants help species of their own kind, and most animals, like ants, bees, chimpanzees and humans, have social behavior. Altruistic behavior is also common among different species. This is thought to have come about because somewhere in the recent past these creatures may have had common genes and later evolved into different species but maintain their benefits for one another or one for another.

The same thing is true with memes. Some memes support each other. Humans also demonstrate behaviors which cannot be explained in terms of genes. Why for example do the rich support each other, when they have quite different genes. Rich people also generally support the same political party, the conservatives, whereas poor people generally support their own workers of labor party. The answer of course is that they have common beliefs or memes, and they have money (which buys meme services) and they would like to maintain their dominance over others.

Nationalism is another example of where people from a common genetic backgrounds help each other, but in some countries like Australia and the United States of America, where people come from a variety of different cultures and genetic background, it is difficult to understand why they support each other so much. The answer is that these people have a common memetic make-up. They identify themselves as being Australian or American.

#### Meme molecules

One of the main problems with memetics is that it is difficult to actually quantify what a meme is precisely. Metaphorically speaking, borrowing from the analogy with biology, we can imagine memes as pieces of information or 'molecules' of knowledge, but this analogy is not precise because it supposes that memes have a linear structure, whereas they are more probably fractal and multidimensional in nature, which means they are more like a network of blood vessels, or like the shape of a cloud. Still, one can in a sense imagine meme molecules being passed on from one person to another. These molecules can change shape, grow (as similar information is attached to them), shrink (as redundant information is eliminated from them), or conglomerate into bigger molecules to form memplexes. An example of this is how bits and pieces of information are combined together to form a discipline of science. The formation of memplexes helps memes belong to them to survive. Some memplexes also become too large and disintegrate into smaller memplexes, such as when different scientific disciplines emerge within a given area.

Today large memplexes can be stored on paper, in books or electronically, on computer, CD (compact disc) or DVD (digital video disc). All of the information in them cannot be relayed directly a single meme to another person. These devices also aid the transmission of memes. We also have libraries that hold books, Cds and videos.

Our definition of meme was something which is transferred between people, but not necessarily something that is imitated. We regard information transfer of any kind between people or people and machines or between machines alone, as memes. Take for example when a computer program performs some calculation for us and give us a result or conclusion. Some memes do not require

any human intervention, such as the transfer of information between computers on the Internet. Today more and more information is being transferred between computer programs around the world, some of which is taking place without our direct knowledge, such as upgrading our software automatically. As memes endeavour to spread themselves, and refine their techniques of transmission, this sort of thing may become more prevalent. Some researchers like Ben Goertzel have been trying to use this idea to build a self-organizing cyber-brain on the Internet.

Since most memes are transferred between people and are hence stored in brains, their representation may be conceived as a dynamic patterns of neural activity. this is probably the most accurate representation of memes, as psychomolecules.

Memes, ideas, inventions, and practices constantly change with time as they are combined with other new ideas and information. Some memes also come and go. For example, someone comes discovers that feeding chickens antibiotics enables them to grow faster, so all poultry farmers start to use antibiotics, until someone else discovers that antibiotics allows the VRE bacteria to develop immunity, so then antibiotics is banned. This example has a biological connection but there are also examples where the connection is purely memetic, for example, a new technique is adopted in the high-jump (the Frosbie **##SPELLING##** flip, where one jumps over the bar backwards) because it allows athletes to jump higher.

Another way to look at memes is to imagine that there is a giant meme which embeds all knowledge, about every conceivable situation. We are searching through this maze filling in bit and pieces of knowledge. As my friend Renato Doria put it we are searching through psychological space mapping out new areas of knowledge, just as explorers 100 to 200 years ago made their way to new lands and expanded our knowledge of geographical and cultural features. As we venture into the unknown psychological space we map out knowledge and connect it to what is known. In this way we extend the frontiers of knowledge.

It is important to note that what is known to humanity as a whole, is generally not know to every single individual. Most people know only about a fraction of the vast amount of knowledge accumulated by all of humanity. Somehow the interaction and intersection of knowledge between all is how society holds this knowledge together.

### Memetic algorithms

It is interesting to note that mathematicians and computer scientist have been using the evolutionary process for over 20 years to solve complicated optimization problem. These methods are referred to 'genetic algorithms'. **###SAY MORE ABOUT GAs###**Recently some scientists have started using what they term 'memetic algorithms', where, unlike biological evolution which passes on information in the genes blindly, information is contemplated before it is passes onto future generations. This premise assumes that there is a role to the self and that something deep occurs in the human brain, that we are not just machine that copy each other. We think about what we say before we pass on information, but then by

the same token we are just a collection of memes, and what we do pass onto others is usually designed to have the maximum ability to spread as widely as possible. Whether or not self-consciousness does exist, the brain does have a special ability to generate new ideas that it did not copy.

### Coevolution of memes and genes

Memes and genes co-evolve, but it would seem that we have now reached a stage where the evolution of memes has practically overtaken the evolution of genes in humans at least and our memes (or way we live) is also affecting the lives of most other animals and plants on planet Earth.

A recent simulation with mathematical model representing competing species (Bull, Holland and Blackmore 2000) has supported the notion that if memes evolve quickly enough they can effectively turn the evolution of genes off. Bull et al find that in meme-gene coevolution that there is a critical period where the evolution speed of memes growth can remain in control of the gene so long as they select memes a high percentage of the time. If they fail to keep control in this manner then they may become completely overcome by the memes and their evolution essentially ceases. A classic example of the power of memes over genes is that there are many people who just don't care about having any children, generally because their careers are more important to them. This would have no explanation in relation to genes, but has a logical explanation from the meme's eye view, if we recognise that we are now more concerned with the evolution of memes than the evolution of genes. In fact one can argue that our genes do not really mean very much. If someone has a genetic disability there are usually carers and doctors to help us (something that is also difficult to explain in terms of memes alone).

We are now even manipulating genes, with genetic engineering, and the weak and sick are taken care of with medical science. It is no longer true that the best (whatever that means) genes survive. We go out of our way to help those with the weakest genes, and those with the fittest genes (best health) do not necessarily have more offspring. In this way memes are interfering with the natural evolution of human genes. Humans, through their progress are also interfering with the evolution of other animals as well, by changing the planet.

From what we have seen above there are many examples of where memes are strongly influencing (or even halting) the evolution of genes. We manipulate genes with genetic engineering, medicine and by our influence on the environment. Even things that we think are genetic, such as our height are influenced by memes. Our children are taller than us because they eat more chickens, which are feed more hormones. The hormones they eat in turn by eating chickens causes them to grow faster, taller and grow bigger feet.

Although human genes may have effectively stopped evolving (REF), they influence the evolution of memes. An example of this is using sex in advertising. There is no question that memes influence biological evolution. We need to make ourselves attractive using current standards, which are different from earlier times, and furthermore we say we have found our soul mate when we have found someone whose memes compliment each other. This may involve either similar memes/minds or different minds that stimulate each other.

Memes clearly have an enormous influence on our daily lives, but the question that beckons is



whether memes also influence our genes today, and whether they influenced our genes in the past (referring in particular to the period when memes first appeared, perhaps in the cave days). I would argue strongly in the affirmative for the former, our children might die if we do not teach them how to cross the road, to wear this example down like a cliché. In order for our memes to influence our genes one would have to show that they could have an effect on the survival of genes, which really means that their influence would have to manifest itself before we are around 25 to 30 years of age, before we have children, because as soon as we have children our genes have been allowed to propagate. Memes can still influence genes after we have reproduced because they may restrict our ability to have more children, and can affect the ability for our children to have children. One way that memes have influenced our genes is that because we are all busier and have devices like television to entertain us at home when we are with our partner, is that we have less children than in the past.

There are countless other ways that memes can influence genes, such as the knowledge or lack thereof of how to grow crops, how to fight infections, etc. We do not have to know these things individually but someone needs to in the human race and we need to have access to the information when we require it. For this access we would have to provide some other memetic service, which amounts to our job, usually passing through as money. The invention of memes to make and drink alcohol, to inhale smoke and chemicals into our lungs (such as tobacco smoke and petrol), and to inject chemicals and drugs intravenously into our bloodstream with drugs (such as heroin) has had a devastating effect on genes. Proper use of the alter may have saved many lives, but inappropriate use has taken a lot of lives as well.

But memes can also influence our genes after we have already reproduced as well, because we can communicate important useful memes to our children and grandchildren, to improve their chances of survival, remembering that they carry some of our genes.

In fact memes influence our daily lives so much, so often and so widely, that it may be fair to say that genes for humans no longer evolve as a biological system should. We save the lives of the sick and weak, and new inventions, like motor vehicles, can take the lives of the fit and strong. One could also argue that humans, referring really to human memes, also influence and manipulate the evolution of other animals on our planet, through the greenhouse effect, pollution, clearing native forests, and helping some endangered species survive by breeding them in captivity.

We have given examples of how memes influence genes. They may explain why we have large brains, we manipulate genes using our knowledge of genetic engineering. In addition to this (see chapter 12) memes have an enormous influence on our how we choose our potential partner, and are one of the main reasons for divorce. Some memes can even wipe out some gene pools, for example in war, which itself is an idea that becomes reality when a large population of people meet with its approval.

One needs to remember that memes and genes coexist and coevolve and may utilize or even manipulate each others marvelous inventions. We have already argued that memes must have influenced genes to develop a large human brain. Some other examples of this are genetic engineering (a memepletic science) and medicine (same) influence biology, as it can help to save lives that would under normal circumstances perish. This affects genetic evolution in that the biologically fittest genes are the ones that survive with the greatest probability. Another example of where memes influence genes is with fast-foods. With the advent of fast-foods we have more

obesity, and more heart attacks. The availability of chickens has also led to the rapid growth of our children's bodies and given many of them big feet and abnormal features. This is a result of the hormones we feed chickens today... When our children eat these chickens, they eat the hormones as well. One could argue that the memetic world around us is part of the environment so these examples are also covered under biological evolution, but we are making a clear distinction here between genetic and memetic evolution.

Today, traditional factors which were, or would normally be, important for survival are any longer important. We protect people with weak genes. People who are sick and invalid, who would normally die if it was not for medical science, live. We also have social security and unemployment benefits to help people like this survive. By the same token, however, these benefits are offered to people who are unable to survive in a memetic world, because memes are what give us employment.

Memes which may be important to our survival are also generally available to most people. We all receive constant warnings about things we should avoid, like asbestos, smoking, and the sun, and we are told how to prolong our lives with healthy eating and exercise. People who are biologically or memetically weak are free to copulate. Generally poorer people and people without careers are more likely to have more children. The biggest driving force in biological evolution today is straight "sex", if you enjoy sex, you are more likely to propagate your genes and propagate them. It's as simple as that. Survival characteristics and information for survival are generally no longer that important.

Some survival memes are still important in our quest for survival today but this is generally on a larger scale. Instead of involving families and communities, the memes that are important today are memes associated with whole countries or races of people. As an example the inability of a country in Africa to deal with an Acquired Immune Deficiency epidemic may wipe out an entire race. The lack of knowledge to care for land properly (such as its over use) may cause famine and kill a large population of a similar genetic makeup. This has happened recently in countries like Ethiopia. Large populations of a specific gene pool, such as the Tutsi people, were wiped out by war and race exterminations.

Another example of where memes can have a profound effect on genes is what Hitler did leading up to and during World War II. Hitler used a meme (or ideology) about the supremacy of the German race to get everyone behind him in an effort to eliminate Jews, and other races for that matter. The meme that he helped propagate affected the propagation of the gene lines on many groups.

Blackmore argues that memetic driving is what has given us large brains and the fundamental reason for that we are the means by which memes spread and they have exerted pressure for us to evolve with large brains so that we can communicate more memes. Blackmore also argues through the same process that memes explain why we have language and why we act the way we do and why we believe there is a self.

The world around us consists of evolving systems of genes and memes, as well as physical evolution. Time is the variable which we use to measure these changes.

Just as memes influence genes, the reverse is also true, in that certain memes that have something to do with strong biological needs do best. For example sex sells in advertising, the insurance business does so well because it relies on fear, the food industry does so well because we need to eat, sport does well because it involves aggression, dancing does well because it is sexy, music does well because it involves emotions (which have a strong biological linkage) and often involves stories. Incidentally music also seems to have a natural progression in the brain. You can almost sense where a particular musical tune is taking you.

### Fitness: Why do some memes succeed?

Songs do especially well if they tap into our emotions, relate to things we know about, or encompass stories which we can relate to. Some songs can touch our soul as it were, but as we shall see our soul is nothing more than a memeplex (or collection of ideas) so in a sense what this means is that such songs just relate to our memes or life experiences, most of which we have copied off others. Stories and songs may also do well because originally we may have relied on stories to learn important information, to learn of any warnings, etc., but now we just spread stories and songs for no apparent reason as well. Songs also do well because we can copy them, and copying is something that we like to do. When a popular song is playing on a jukebox or in a bar people love to sing along to that song along with everyone else.

It is important to realize this, that memes do not have to be useful (biologically or even memetically) to get propagated. If the songwriter expresses our inner emotions, and the singer delivers the message effectively, we pay special attention to it and if enough other people think like us the song becomes popular.

Advertisements especially succeed if they use sex to sell their message. The reason that these things happen is that memes with a biological connection, tapping into our instinctive biological urges have an enormous advantage. Dancing may do well because there is a sexual connotation to them. Insurance business does well because there is a connection to fear, which is a primitive instinctual emotion. Sport does well because there is a physical survival connection.

There are other things that we do or copy that have a strong biological connection to why we do them. Example of this are smoking cigarettes and drinking alcohol. It is known that some people are genetically geared to get addicted to smoking and drinking more so than others, but as we will argue some of our pleasures are also memetically based and we may also copy these 'habits' because other people around us do it. We may have friends who smoke and drink and engaging in these behaviors ourselves may help us fit in better with these groups. Music and dance are other examples of things that are largely memetically based but also have a strong biological connection. Music, and dance in particular has strong emotional and sexual connections that make them popular.

There is no real identifiable meme fitness, but memes are competing for attention from humans and in some way for the limited space in human memory. Perhaps limited by human attention is a better concept. Also all of the memes also tie in together in some way. Some can support others, while others are to the detriment of others. It is difficult to know which is which or how the different memes relate to each other. If you like then, there is a global fitness which every meme must satisfy, and this global fitness is nothing but a measure of how the various memes fit in together.

There is no real identifiable meme fitness, but memes are competing for the limited space in human memory (if it is limited). Perhaps limited by human attention is a better concept. Memes either support each other and coexist, (just like different species cohabit in biology) or they compete with each other. A memplex is itself a stable configuration of supportive memes. It is difficult to know which is which or how the different memes relate to each other. If you like then, there is a global fitness which every meme must satisfy, and this global fitness is nothing but a measure of how the various memes fit in together. In other words the fitness function is a sort of collective phenomenon of how well things fit in together. Humans play a prominent role in this collective decision process. They are who decide what is worth keeping and spreading. If humans do not continue to support a meme, it dies or goes into remission until someone comes along to revive it later. It is interesting to note that a particular creature or meme, or memplex may survive happily in a particular environment at a particular time, but may die in a different environment. In other words the fitness or goodness of something is intimately linked with its present moment and circumstances.

The fitness and survival prospects of creatures is determined by how well they fit in with other species. In the same way the fitness of memes is determined by how well they fit in with other memes, ideas and knowledge that already exists. A new idea is only taken on board if it agrees and fits in well with what is already known and accepted. This is especially evident in science where progress has to incorporate existing knowledge, but also true in general. Growth in our knowledge is as a consequence generally slow, and we build upon it using previously acquired knowledge. Ideas which are too creative or too revolutionary generally do not make it. Sometimes great ideas are only accepted many years after they have been conceived. This restricted expansion of ideas also restrains memes from varying too excessively. As we shall see later, new ideas are also based on old ideas. The human brain generates new ideas by combining known ideas in novel ways utilizing what is already stored in them. They do not come out of the blue so to speak, but are based on knowledge. We will elucidate this later, but it is also fair to say that a new idea would not mean anything to us if we did not know something about it.

Story memes seem to do particularly well for some reason, even if they are fictional. This suggests that some memes, that capture our attention are neither biologically nor memetically important, by which we mean that they neither help us for our biological or memetic survival. Stories may be interesting because we can relate to them and this suggests a link with the self.

As mentioned above, the fitness function for memes is constantly changing. What may be fashionable today may not be fashionable in the future, and some fashions come and go and come back again. A classic example of this is hairstyles. About 200

years ago it was fashionable for men to have long hair. Then it was fashionable for men to be well groomed and have short hair, only to return back to long hair in the 1960s and 1970s. The fashion is back with short hair today.

As memes evolve they also invent other means to enhance their evolution. For example one can argue that the Internet was invented to help memes spread more widely and with greater speed. One should not be surprised if memes come up with new methods and new tricks for their survival and propagation.

Memes can evolve slowly and quickly, it all depends on the level of mutation. Too much mutation is however not beneficial for evolution. Memetic evolution is controlled by what knowledge is known, and new ideas (also based on knowledge) generally have to fit in with what is known. In science for example new theories are based on old theories and ideas and are only accepted if they encompass old theories and make an advance in our understanding. Laws for example are only changed as a need arises and once again these have to be consistent with other laws. As we shall see later we also tend to choose our friends and partners based on our memetic beliefs, so once again we slow down the rate of memetic evolution by doing so. We will say more about this later, in chapter ##, when we look at potential problems with the meme theory.

### Catastrophic situations

The most rapid period of genetic evolution occur when something drastic happens to the environment. Humans suddenly appeared as a major force in biology when the Earth was bombarded by meteors some 65 millions yaers ago and the dinosaurs became extinct. If something drastic did not happen all the creatures in the world would be happy going about co-habiting together. When the world was suddenly changes all the creature had to readjust to survive and fit in with what was left behind after this catastrophe. By this we mean some mutants suddenly find that they best fit in with the new environment around them, and the species evolve. Some species would have lost their usual food supply, and they would need to adapt to find a new niche in the biological world. If this was not possible the entire species would die. By the same token, new species would come into being that better fit in with the new world that had suddenly taken form.

The same is true with memetic evolution. An example of this is what happened on 11 September 2001, when terrorists from the Al Quaida organization flew passenger jets into the World Trade Center buildings. This has forced many people to rethink everything about security and this has changed all of our lives in a big way. Suddenly the USA is no longer tolerant to some countries like Iraq having weapons of mass destruction, and some countries, lead by America, are sending troops into Iraq for war, unless Iraq rids itself of weapons the 'free' world regards as dangerous. Tolerance to North Korea having nuclear weapons has also diminished as a result of this. A war in the middle-east will have dramatic effect on everyone around the

world, the financial markets, the political scene and our everyday lives. We now have to check every piece of luggage before we fly. Financial markets have practically stopped growing, and if America attacks Iraq oil prices will soar. A whole new paradigm of catastrophic change has emerged from this simple act of terrorism. The biggest influence is however on the human psyche and our way of thinking.

On the question of starting a war with Iraq, it is interesting how public opinion has been swelling to against the war. This is mainly driven by what other people think (they are just memplexes) and what the media is telling them, because remember they are just copying each other. We will have more to say about the self later and the way that media plays such a prominent role in public opinion, and propaganda. These are very powerful forces in politics.

Another example of where something has led to significant change is when Martin Bryant killed all those people in Tasmania. This led to the banning of all guns in Australia. The other day I watched a young boy, with his father playing with a machine gun in the city. He was happily going around shooting at people. I expect that not before too long, these toys will be banned as well, because they may encourage such behavior.

One of the greatest revolutions in memetic evolution was the advent of the computer and its availability to the masses. This is why Bill Gates became such a rich man. Once the computer was invented it suddenly became easier to write things and to keep records, then came the advent of email, which allowed us to transmit information to each other quite easily, without the need for formal letters. This was followed by the advent of the Internet, which has now made it easy to acquire and spread information with astonishing ease.

Great discoveries in science also result in great variation in memes or ideas, shaping new ideas for decades to come. Sometimes even simple discoveries like the link between passive smoking and cancer has led to drastic changes to our way of thinking and tolerance. As a result of this link we are now no longer allowed to smoke in most public buildings, and in doorways. It was not that long ago that people used to smoke in movie theatres and on public transport. Those images seem such a long time ago now.

## **4. The birth of the modern human**

### **Why are we mentally so different?**

Other than our mental capabilities we are very much like other mammals. We share many physical features with other animals: we have legs, two eyes, two ears, a heart, a brain (or nervous system), the same sort of organs. The brains other mammals have similar brain structures with similar brain organs, like a cortex, a thalamus, a hippocampus and a brain-stem. The only difference is that we have a much larger brain, actually a much larger neocortex, and this is mostly housed in the frontal lobes. Incidentally chimpanzees for example are known to have a larger visual cortex than us. And as a result of this slightly different brain structure and its largeness we can think, speak, read, write, sometimes in many languages, we are conscious of what is going on around us (other mammals may also have this attribute), and we also possess the amazing feeling of self-consciousness (which other mammals do not appear to have), which give us the sensation that we are in control of our actions.

Our ability to copy each other, and communicate memes, is what truly separates us from the rest of the animal kingdom. Humans have gained an enormous advantage with this ability. This cannot be underestimated. Just imagine how beneficial it was to discover (and tell others) that we could plant our crops from seeds. Consider also what the consequences would be like if we had to reinvent the wheel everytime. This is largely how most other animals live, and even those who are able to communicate and copy to a limited capacity, such as certain chimpanzees in Africa, their resources to be passed on are very limited. On the other hand, humans have extensive tools at their disposal to gather and pass on such valuable information. We have language (spoken and written), libraries/books, radios, recording devices, television, and the internet. If you are really interested in finding the answer to something (as long as it is not the origin of the universe, or the neural basis of consciousness) then you can quite easily find the answer in these numerous and extensive recorded resources.

The evolution of memes and the pressure they have exerted on genes, is the reason why we have evolved with different mental capabilities compared to other animals; and in particular why we have a much larger brain and language.

With Blackmore's strict definition she argues that other animals do not copy each other. She further argues that many of the things they copy, such as when a baby bird copies a song from its mother, is innate. We believe this is a rather strong statement and perhaps can be weakened to include some things that animals do as thinking and copying processes. The line dividing what is innate or instinctive behaviour is difficult to define (Gould and Gould 1994). Recent research (article in Scientific American) suggests that chimpanzees copy each other much more than was originally anticipated. In any case, what is true is that humans copy each other to an incredible extent. I myself have observed the behaviour of crows skullderging through rubbish bins using tricks that they could not have all invented for themselves, but must have been copied off others.

What truly separates us from the rest of the animal kingdom is our ability to think, to understand, to reason, to communicate our thoughts, to learn, to imitate, to teach, and subsequently our ability to adapt quickly to a new situation, using our vast knowledge base and our extraordinary ability to adapt and be creative. This clearly has an evolutionary advantage. We rule the Earth! Our abilities now separate us widely from other animals and it is quite unlikely that any other creature will be

able to evolve in the way we have, as we affect all other creatures around us. Although these abilities may have a biological or genetic survival edge to them they are also very closely related to the acquisition, manipulation and transmission of memes, so it is natural to ask if ‘memetic driving’, which is a term Blackmore has used to describe the pressure that memes may be exerting on genes to adapt to their whims, is important here.

We take the capabilities of the human mind for granted. Even the average John Doe can plan, think, reason, speak, write, understand, learn and imitate. Just stop for a second and think what an ordinary person has to go through in his daily existence, it is much the same as we all have to go through. We all have to deal with financial problems, social relationships, maintaining a job, and solving new problems as they arise in our daily lives. One would imagine that these capabilities require a large brain, but the question is which came first, the chicken or the egg? Did a large brain allow us to develop these capabilities, or did these capabilities result in the massive expansion of the human brain? Memetics suggests that it is a bit of both.

A nice way to put all of this is that genes represent our physical attributes and memes represent our spiritual and mental attributes.

### The power to imitate freely

Humans have an uncanny ability to copy, imitate, and learn from each other. This, according to Blackmore, is what truly separates us from the rest of the animal kingdom. Some intelligent animals, like dolphins, chimpanzees and some apes, show some amounts of imitation. In her book, Blackmore tells of a dolphin which would receive a reward of fish if it performed the tricks requested by the trainer. If the dolphin did not perform the trick satisfactorily the trainer would retreat away from the pool for a couple of minutes and not feed the dolphin. One day the trainer unwittingly gave the dolphin a bony fish and the dolphin retreated to the far side of the pool for a couple of minutes. Some chimpanzees in Africa copy each other as to how to break open nuts, how to use sticks to eat ants, and some chimpanzees in Japan copied humans by using a natural hot spa, that was previously used by humans, for their own leisure. (#FIND OUT NAME OF MONKEY AND MORE DETAILS#) I watched some crows going through rubbish bins one day. They would rip open bags to see if there was any food in them. I noticed that when they found a package with plastic wrap that they would fly away with it and stand on it with both feet and unravel it with their beaks. I wonder how much of this was innate behavior and how much was instinctive, and whether they copied each other. There is also the example of small birds called blue tits stealing milk from milk bottles in England by peeling back the metal caps (Gould and Gould 1994, p 74). This practice was reported to have spread from town to town and some reports even suggested it spread across to the European continent. It is hard to imagine that all of these birds thought of this idea at the same time, so it would seem that they copied each other. There are also examples of monkeys copying humans. In Malaysia, farmers have to be mindful of monkeys stealing their crops and goods from around the house. Some farmers took to throwing rocks at some of these monkeys to scare them off, but some of these monkeys returned later throwing rocks at the farmers themselves. Such behaviors are however quite rare in animals, and animals certainly do not copy to the extent of humans. We are extraordinary copiers.

Recent studies (A. Whiten and C. Boesch, “The cultures of chimpanzees”, Scientific American, January 2001, pp 49-55) have shown that chimpanzees also imitate. Some of the examples given



are hammering nuts, pounding with pestle, eating ants from a stick and fanning flies. Whiten and Boesch state that at present there are about 39 different chimpanzee behaviours which may be classified as cultural. Another important finding is that different colonies of chimpanzees had different cultures (William McGrew, *Chimpanzee Material Culture*”, Cambridge University Press, 1992), for instance some colonies fish for ants with sticks, while others do not, and from those who fish for ants, some eat the ants off the stick directly, while others sweep the ants into their fist and then into their mouths. Some colonies pound nuts with a rock, and others even use a pestle, whereas some just try to crack the nut with their teeth. In fact by observing the cultures or habits of a chimpanzee one can identify which colony the chimpanzee comes from. Although human culture and imitation is much more vast, these findings suggest that we are not as special as we think, and it is not inconceivable that if chimpanzees and apes were allowed to continue to evolve unabated (they are sadly constantly in danger of extinction) that they too may evolve with much more intelligence and a much richer culture like ours. If we are the result of memetic evolution, it must have started from similar simple beginnings as well. There is nothing really special about ourselves. We imagine that somehow we are unique. History is plagued with human misconceptions about reality and truth. In the early 1960’s we would have sworn black and blue that the proton and neutron which make up the nuclei of atoms were the most fundamental particles possible, only to discover that they themselves are made up of smaller particles called quarks.

Humans have an uncanny ability to copy, imitate, and learn from others. This is what seems to truly separate us from the rest of the animal kingdom. Even our closest relative, the chimpanzee, does not copy anything as much as what we do. Sure they use rocks to crack nuts, and simple things like that, but just think of the things we do. Everyday we are learning something new, and it’s a lot more profound than cracking nuts. Students are learning about Calculus, scientist are learning about new theories and discoveries, we are all learning about the world around us, which changes every day. Over our lifetime we learn so many things; we learn how to speak, write and read, we learn how to survive in a complicated and complex world. And what is peculiar is that many of these things that we have to learn do not have a biological survival factor. So why do we learn all of these things, if they are not important for survival. The answer is that we learn them to propagate our memes, or memes in general.

As an example of the poor copying ability of other intelligent animals, there is a group of macaque monkeys living on an isolated island, has one monkey that appears to be exceptionally creative. Her name is Imo. She discovered how to wash the sand off wheat that floated in of ships. She took potatoes covered in sand and washed it in water. She was then able to eat the potato free of any sand. In this troop there are around 60 monkeys, and it took 3 years for this creative idea to spread to the other monkey. After 6 years 17 were washing their potatoes, and after 9 years the number had grown to 36 (The Animal Mind, James L. Gould and Carol G Gould, Scientific American Library, New York 1994).

One also needs to note however that generally most animals do not imitate very well. As an example, there is a group of macaque monkeys living on an isolated island, has one monkey that appears to be exceptionally creative. Her name is Imo. She discovered how to wash the sand off wheat that floated in of ships. She took potatoes covered in sand and washed it in water. She was then able to eat the potato free of any sand. In this troop there are around 60 monkeys, and it took 3 years for this creative idea to spread to the other monkey. After 6 years 17 were washing their potatoes, and after 9 years the number had grown to 36 (The Animal Mind, James L. Gould and Carol G Gould, Scientific American Library, New York 1994). Birds for example may copy songs from their parents but this is generally singular, in others words they do not copy much else off each other. This is not quite true as birds copy each other when they are flying around together and when

they are all squarking together in a tree. Blackmore suggests that bird songs are an innate biological behaviors but the situation is never that clear, as some instinctive behavior may also be involved and we are suggesting in this book that instinctive (or thinking) behavior is tantamount memes. Thinking is a process whereby we combine information together in novel ways, and this process may combine information observed in others in some way. Our premise in this book is that animals, just like humans, are creative, or at least adaptive, as both have spurious memories, as they are natural consequence of the distributed and overlapping storage of memory in neural systems. Although creativity and adaptability are necessary to generate something that is worthwhile to copy, it does not mean that animals necessarily imitate or copy each other. We agree with Blackmore on this point. As all animals have spurious memories and hence creativity, we believe that what drove our memetic evolution, but what gave us extraordinary sized brains was the ability to imitate, which animals are generally quite poor at. Others (see below) have suggested that creativity was the real bottle-neck in evolutionary development. We also disagree with Blackmore on one important point. Blackmore suggests that creativity developed because of memes. We believe that creativity existed first, maybe in the form of an ability to adapt, because this would give us a survival advantage. This is why we have brains and much of our knowledge is not passed onto our offspring in the genes. There is no need to because they can quickly acquire such information through their nervous systems. We do believe however that memes, or the ability to communicate and share knowledge with others, helps to accelerate the process of creativity. Society can judge the merits of a creative idea, and we do recognize the important of creativity as we encourage it. Most awards and prizes are generally given to people who are creative and different. The most important music awards (like the Grammys) are given to artists who come up something new; most art awards are given to people who produce something very different; and most accolades in science are given to scientist who come up with a completely new way of thinking about something.

The other matters such as speech, language, thought, reasoning, understanding and the 'self', she argues are of secondary nature and were developed for the benefit of the memes. Blackmore argues that it is the particular need to imitate that has driven the rapid expansion of the brain. Blackmore suggests that it is the subsequent evolution of memes or ideas that has then driven the evolution of the human brain so that it would develop the other features such as language, and the 'self'.

The evolution of memes has also resulted in the structured and organized world around us, technology, the Internet, and is also responsible for much, if not all, of human culture.

Memes may also explain some other puzzles about human behavior, such as why we so freely associate and communicate with other human being, who are not related to us genetically, and why we engage ourselves with unusual and esoteric practices. It is quite clear that there are many things which we do which do not seem to have any biological need for.

We will review some of these extraordinary claims made recently by Blackmore (1999). We will also try to point out that some of the features that memes can explain can be housed in a less elegant less exuberant theory were information is seen as a means to increase one's chances of survival, without the need to propose that we are controlled by the evolution of memes.

### The origin of memes and memetic driving

As we shall see in the below, Blackmore has argued that memes influenced genes in such a way to exert pressure on humans to have large brains, and to develop language and exceptional

intelligence. Memes can only influence the genes if there is a direct advantage (eg more offspring) or disadvantage (e.g. death to the phenotype) to the genes. Gene-meme coevolution is crucial to the Blackmore arguments about the influence of memes on the origins and evolution of language and large brains. The leash works both ways between genes and memes. The other interesting point is that in order for memes to actually interfere/influence the genes this disadvantageous outcome (eg death) to the phenotype has to happen before he/she has had a chance to reproduce.

Blackmore has argued that memes may have been very important to humans in the cave days, when our brain first started to expand. Clearly it would have been crucial to know which poisonous plants to avoid, how to make tools and weapons, how to light fires, how to build a house or cave, and how to harvest food from the land. As more and more biologically important memes were discovered (in human minds), it became more and more important to keep up with current knowledge, otherwise others would have the survival edge over them. We had to develop the ability to copy others or we would be left behind. At first we would copy the creative people and the best imitators and later we would start to mate with the best imitators (and the most creative I suppose). Blackmore suggests that this is what resulted in the original rapid expansion of the human brain. After awhile the memes would have come into the game in their own right, with their own little evolutionary agenda.

So how did we evolve? Initially the most important attributes that helped humans to survive, were their physical features. Our upright position, our speed, our precision, our height, our physical strength, and the ability to use our hands would have been important for our early survival, but once we established physical superiority, memory and skills would probably started to play a bigger impact in our evolution. We learnt how to make tools, how to hunt animals, how to grow crops, what (poisonous) plants to avoid, how to defend ourselves, how to build weapons, how to treat ourselves against injury and illnesses, how to prevent illness. This information would have been crucial for our survival and may have impacted on within the lifetime of typical humans at that time. For example many humans may have died without the knowledge to avoid certain poisonous plants, or to clap and cut the umbilical cord of newborns. The lack of knowledge on how to cultivate land, makes tools and weapons would have also been important. Today we need to know how to cultivate land non-exhaustively. In Africa large populations still die as a result of this.

It is during this period that knowledge or 'memes' may have had their greatest influence on evolution of the human race and the human brain. Human families, and/or communities that worked together, could share such knowledge for their mutual survival. Without certain information certain individuals, groups, communities and species may die and become extinct. Imagine that one group of humans had acquired the knowledge of how to store food so that it could be used in times of famine. This group would have greater prospects of survival in such situations. Even today knowledge or 'memes' can be important, as we need to teach our children what dangerous household chemicals and medicines to avoid, how to cross roads to avoid being hit by motor vehicles. One can imagine what would happen to a family in today's society who were not shown/told how to cross the road. The point is that the evolution of human society and its growing complexity has undoubtedly meant that people need to know more and more to ensure survival and those that were unable to adapt to these needs would have died off, leading to the selection of genes that lead to a large brain capacity. There is also the question of whether we have such large brains so that we can store so much information or memes, or so that we have the ability to imitate. Probably a bit of both.

That shared such knowledge obviously improved their prospects to survive, or improve on our

prospects of performing the 4 F's (foraging, fighting, feeding and reproduction) which are the crux of survival. Obviously the situation is much more complicated than straight memes, because cooperation and competition also come into play. Humans are also competing with other humans so they may share a lot of information with other humans but may reserve certain information for their families only. It doesn't pay to tell everyone everything you know, but if people think you are withholding too much on them, they will not pass on information to you. There is also then a great advantage to be more cooperative with others than to remain in complete isolation. It is well known that certain problems are resolved by working together in groups, and students learn well when they work in groups. In some cases the problem is too large and unmanageable if tackled on our own, and the only way to proceed is to work as a team. There are also many cases where useful memes are developed by collaborative interaction, that is how a lot of scientific research is done. In this respect, some memes are created by the collaborative processes which generate creativity. These systems can actually be equivalent to the rapid exchange of memes.

### Sharing information and cooperation

Clearly cooperation between people is important in the transmission of memes and memes are slaves to this interaction between humans, as well as the human ability to be creative and generate new memes. We also need to cooperate with others because of the way society has developed. We rely on each other to do things for each other in this complicated memetic world, as we are no longer able to do everything ourselves anymore. We will discuss this further in chapter ##, but will say here that the reason why the world has become like this, why it has become so complicated is based on memes itself, and our endless search to find a niche for ourselves in this world.

Competition is also an integral part of memetic evolution as it benefits memes themselves. There is nothing really new here as cooperation and competition also exist in biology. Plants and animals are in competition with each other and cooperation between certain species helps them to survive. One can also suggest that these aspects have evolved as all the creature try to find a way that they fit with the environment around them. The same is true of us and memes. We all need to somehow fit into the memetic world.

### Absence of other closely related human-like species

In evolutionary biology one expects to have a lot of species which are similar to each other. This is called adaptive radiation (#LOOK THIS UP AND GET MORE INFO#). For example, there are lots of different types of cats: tigers, lions, leopards, and domestic cats to name a few. The origin of this is that if cats evolved from some common ancestor then as evolution took place lots of different types of species should evolve from this common ancestor. One puzzling fact in biology is that there are not (if any) other species closely related to humans. There are of course different human races: Caucasians, Asians, and African, but this is not what biologists are referring to. According to them there should be a lot more species which are similar to humans, but are not human. Why are there a lot more species with large brains like us, or species which walk upright? Why is this so? As biology cannot answer this, it may be worthwhile to see if memetics can. One possibility is that we (humans) killed off other races once we invented weapons. We may have seen these other races as a threat and killed them off to protect our own species.

## 5. The role of the family unit

### The role of the family unit

Up until recently the family unit has been the most important entity in human society. As we shall see below, not only does it serve as a biological unit but also as a memetic unit, for the survival of memes. Recently however, these 'same' memes have resulted in it becoming exceedingly easier and more popular for families to separate and divorce, and for many people not to even get married, or have children. Ideas (or memes) that it is okay to separate or have no children have spread into today's society. In addition to this because we live in a more complex memetic and psychological world, it is less likely to find a partner who is compatible with us (there are more things we have to be compatible with), and remain compatible as well. This increases the likelihood of divorce, and explains why marriage is less likely to occur.

Although the family unit is primarily based on and concerned with preserving common gene pools, it is also important, in spreading and preserving memes (and traditions), but with today's society memes are freely spread outside the family unit, and this has somewhat diminished the function of the family. As we have argued before our memetic desire to spread memes also explains why many people often put their careers ahead of their families. They are more interested in spreading their memes than their genes. Also when our children have grown up we realize that we have fulfilled our biological goals and now it is time to spread our memes. Our desire to spread memes also explains why some people who get married do not have any children, and why many people do not even get married. Memes have become, and continue to become, more important in our lives than genes. People are now more interested in passing on their memes than their genes. Nevertheless the family unit is still basically quite important for the preservation of genes, as well as memes.

As we have seen above memes can also be important for biological survival, and this, we believe, is the reason why memes started evolving in the first place. The family unit played a crucial role in the development of memes and their evolution. Some memes that we pass onto our children are important for their biological survival, such as how to cross the road, how to take care of their health, and how to dress and act (so as to attract a partner). The family unit is also important for the memetic survival of our children. We need to allow them to develop mentally so that they can take care of themselves in a complicated memetic world; to carve out a memetic niche for themselves and to interact with others. We also suggest that the need to pass on memes may explain why we humans live for so much longer compared to our other animals, long after we have reproduced biologically. Children also pass memes onto their parents as they get older. They educate and keep their parents informed on changes in laws, beliefs and community opinion, and new ideas for the prolongation of their lives and improved health.

Finally we should put all of this into some context as other animals also have families and societies. Many mammals take care of their young for a period after birth, but this we believe is more the biological survival of their protégé. Chimpanzees and gorilla for example live in families. What is exceptional about humans is that they do this for such a long period, for around 25 years today, and even after the children have left home we continue to take care of them and eventually we present the same sort of attention to our grandchildren as well. We believe that this is so because we need to show our children how to survive in a complicated memetic world as well. This is why we pride ourselves on providing our children with a good education. We not only want them to succeed biologically but memetically as well. We would like them to find a profession (which is really just a collection of memes - see discussion in chapter #) that enables them to live comfortable lives, and

survive in the memetic world. If they make enough money, this enables them to buy meme services from others. Later on we will also explain why we also have a particularly special interest in spreading our memes to our children. Not only do they carry our genes but they also carry our memes. This is also closely linked with the illusion of self, or the belief that we have an internal identity or soul.

In a later chapter when we discuss social behavior, we will look at what drives us to form relationships with others in more detail. What marriage is, and why people separate.

### Human longevity

Why do humans live for much longer; around 60 years more, after their reproductive period? Most other animals live not much longer beyond the period when they have reproduced. Memes may offer an explanation of why we humans live for so much longer than other species, well after we have reproduced, and why we want to live for as long as possible, and why we are trying to prolong our lives as much as possible using medical technology. Most other species normally live for as long as they need to reproduce. Some insect copulate then die. In the case of the black widow spider, the female eats the male spider immediately after sex, so his body can be used to nourish the baby spiders. One reason we live for so long may be that we need to know so many memes, but once we have reproduced there would be no need to know any more, if our purpose of existence was of a purely biological nature. Another reason we may live for so long is that we need to pass on our memes to our children and to our grandchildren, to help them with their survival. This refers to their biological and memetic survival in the complex memetic world.

Another reason why we may live for so long is that we live for our memes, to immortalize ourselves, or that is our memes, to be remembered, to be immortalized.

Another possibility is that complex memetic world evolved around us because we live for so long. The fact that we live far beyond our biological needs, gives us more time to contemplate things that are not biologically necessary and hence we have become involved with memes. This explanation of longevity would however have to explain why we started living for so long in the first place.

Remember that it is not only our biological survival that is important, but also the survival of our memes. Admittedly most mammals also care for their young, but leave the family as soon as they are able to cope for themselves. Gorillas and chimpanzees seem to live in close nit family communities for some time, but it is now thought that they too may transmit memes to each other, but obviously not to the same extent as in humans. It is known, for example, that chimpanzees in Africa actually show their young how to break open certain nuts, and some chimpanzees copy each other on how to use a stick to collect ants from an ant's nest, while other chimpanzees in Japan copied humans by taking over a natural hot-spring spa. Most animals pass some information onto their young, but most of this, if not all, has to do with biological survival, such as how to find food, how to make certain cries, and in some cases how to act. Humans are special in that they also have to provide their young with the ability to survive in a memetic world. Living together in communities also has some biological survival advantages, as groups of animals can protect one another, and those coming from the same family unit have biological interest in protecting and supporting each other. .

Some memes require a family for delivery. This may also offer some explanation of why we have families, other than to propagate our genes. There is a strong tendency for families to stay close together well after the parents have had children. Could this be because we want to pass on our memes. The mother is generally meticulous in teaching her children how to behave and how to groom themselves, and the father is busy passing on his skills to the children. Families, like Greeks, Italians, Chinese and Indians, particularly when they emigrate to another country try to preserve their traditions and customs. Often they even try to enforce customs on their children that are no longer adhered to back in their old country. I know about these things from first hand experience as my parents came from Greek Macedonia. Children often tend to revolt against the customs their parents try to impose upon them, particularly in the case of immigrants, because they have grown up in a different memetic society to what their parents are used to. This also applies how many children react to their families anyhow. They develop their own friends and start to belong to peer groups and develop their own beliefs or memes, and want no part of the memes which are being offered by their parents. This is one of the main reasons why some children do not get along with their parents. The parents are trying to impose their memes onto the children and the children want to develop their own memes with their friends; they may even think that the parent's memes are irrelevant.

No other animal other than humans goes to the trouble that we do to bring up our children, for such a long period after they are born. Most animals on the other hand care for their young for a relatively short period. It is also interesting that the period that our children stay at home seems to get longer and longer. They need to know more to survive in today's complex memetic world. There is much to learn and one of the main functions of parenthood is to impart our knowledge and wisdom (memes) to them. There is also a good reason, other than the obvious biological one, why we would do this, as we are also passing onto them our memes, that we want to survive and propagate. We will discuss this in more detail below when we consider the self.

The other point which we touched on earlier is that we live for so long after we have produced. Is there a reason for this? One could say that medical science has extended our longevity but what is medicine but a collection of memes, so memes are the reason why we have lived for so long. And if we stop reproducing after 30 years or so, why do we need to live for so long. I would suggest so that we can pass on our memes, particularly to our grandchildren.

At the end of the day, when our life is over, one can reflect back to see what we were worth, and what matters, all that really matters is what memes we have left behind. Material things, unless they are something unusual or substantial, do not matter. Our lives are a quest to find as many memes as possible and this also makes up our identity, and our self-esteem. We strive to pass on as many memes as possible and to participate in the human quest to find and advance the evolution of memes.

With the life-expectancy of humans (currently 70 to 80 years) well exceeding their reproductive period (around 20-30 years) it is difficult to imagine how behavioral information could be or could have been so important to affect our genes, or our ability to reproduce. Matters may have been different in the cave days, with a life expectancy of around 30 years, but we would argue that memes could still have influenced the genes, and that they may still do so even if our life expectancy is more like 70 years. Imagine that a child today is not properly shown how to cross the road. His chances of getting run over by a car are subsequently higher than other children. By the laws of probability there will be a slight tendency to favor those children who know how to properly cross the road. This lack of knowledge also carries over to the children of the child who

does not know how to cross the road properly, because they are unlikely to show them how to do it properly as well. In this case the survival of the genes of the original individual are also affected indirectly.

What we have to remember is that now things do not just happen for the benefit of our genes and biological survive but for the benefit of memes as well.

Once memes became important for survival then so did the need to live for longer, as then we could communicate these ideas and survival tricks to our children and then at a later stage also to our grandchildren. Note that educating our children is a long-winded process and this may further explain why they need to live with their parents for such a long time (around 20 years and growing at present). We need to learn as much as possible to prepare ourselves for independent life in a complex world. We have to know how to take care of ourselves, how to make a living, how to interact with others, how to raise our own family, and so on. Grandparents also play a prominent role in preparing children for life. Grandparents carry a lot of information. Originally their need to live longer was guided by the fact that they could help the parents by looking after the children while the parents went out hunting, food gathering, or whatever. Elders are also advantageous because they have about 30 to 40 years more experience. Originally the information provided by elders to their children and grandchildren would have had a strong biological sense. Tribes with elders would have been at an enormous advantage. Today grandparents provide a significant cultural and social input into the development of the child. I would imagine that we did not live for as long as we do now, so this reflects the increasing need to have input from grandparents and this may explain why we live for so much longer after we have proclimated. Originally we started to live for longer to pass on our biological memes to our grandchildren but now this has grown to also include other memes with a memetic, psychological, social or cultural basis. The fact that we go out of our way to prolong the lives of the elderly (through medicine and care) also reflects the fact that we recognize the importance of their input to our children, other children, and to society as a whole. Elders are generally much wiser and play an important role in preserving our heritage.

Another explanation of why we live for so much longer after we have reproduced, and more so in recent times, is that we want to continue to spread our own memes, with no biological slant at all, and society as a whole recognizes this. We are all searching for immortality, which means we would like to leave some part of ourselves, or our personality, that will survive us after death. Why is that? We want to be famous and remembered because of memes. See also the discussion below on 'fame and careers'.

### Nature versus nurture

The argument about nature versus nurture boils down to that of gene versus meme. From numerous investigations both seem to be influential. For example, although there is a strong link between schizophrenia and genes, and between Alzheimer's disease and gene, there are many more cases where genes are not implicated suggesting that the environment (memetic and physical environments) in which we live has an enormous influence on our health and survival.

We have to learn much from the day we are born, not only how to walk but how to read, write and behave. Although some of this is now taught at schools, much is still learned from the family. The question is how much of us is due to our genes and how much is due to the way we are raised?



Genes clearly determine things like most of our physical behavior (not all as some of this depends on what we eat), the color of our eyes, etc, but memes determine how we act, although by the same token we may inherit a certain temperament from our parents.

It is known that when we are born that the brain is only partially wired, and so it follows that much of what we learn is based on our life experiences.

At birth an infant has almost all of the neurons of adulthood, maybe even more, the only key difference between an infant's brain and an adult's brain is that the infant brain is only partially connected. It is known that memory is stored in these connections so that much of what an infant learns is learned through the interaction with its environment. The rapid rate in growth of synaptic connections in the infant brain can be inferred from the increase in brain weight with age, since most of the increase in brain weight can be attributed to the growth in axons and dendrites by the immature neurons. At birth the weight of a newborn's brain is approximately 330 grams and this increases to about 1000 grams by the age of 2 years, followed by a much slower rate of increase up until the age of 14 years, when it is thought that the brain has reached maturity (approximately 1400 grams). If one assumes that the newborn's brain has practically no synaptic connections, which although unrealistic is not a bad assumption for the purposes of this calculation, and that by 14 years of age it has one million billion connections, one can conclude that one gram of brain weight corresponds to approximately a thousand billion synaptic connections. This means that in the first two years of life, which corresponds to approximately 63 million seconds, an infant makes approximately 670,000 billion synaptic connections. This amounts to making a staggering 10 million connections every second for every moment of the day, including the times when the infant is asleep. From the age of 2 years to 14 years the growth in synaptic connections slows to about one million connections per second, which is itself still considerable. Most of this so-called critical period is devoted to establishing important neurological and biological features such as vision and movement. Following this critical period I would suggest that most of the connections that are made are primarily concerned with memetic details, such as how to speak, how to read and write, languages, mathematics, and how to behave socially.

There are good reasons why most of the synaptic connections are not made while the baby is in the womb. First of all, there is insufficient time to make all of these connections, and most of the neurons have not even been created as yet. More importantly, though, most of the synaptic connections, which themselves are where memory will be stored, need to be made while we are interacting with the environment and other people. If the human brain was completely connected at birth, it would be far less capable of adapting to unforeseen circumstances, and new challenges in survival. Finally, it has been argued that there is insufficient information in DNA to tell the brain how to hard-wire itself (Changeux REF). The majority of the brain's connections must be made randomly and in accord with experience.

We often hear children repeat something their parents say, sometimes in an embarrassing situation.

The saying is “from the mouths of babes”. This reflects the fact that our beliefs heavily influence the beliefs of our children.

Another interesting point is that although siblings are quite similar genetically they seem to be more likely to develop quite different personalities and to pursue quite different careers. It has been suggested that the reason they do this, is because they are effectively in competition with each other to gain the attention of their parents, or to impress their parents in some way. ##REF### So if one sibling is good at something, say academically, the other siblings will look for something else that they can do to impress the parents, and this invariably makes them choose something else, generally quite different. Although we would go along with this to a certain extent, we believe that memes play a more direct role in what siblings choose to do. The whole question of impressing one's parents for the benefit of the individual really presupposes that there is self that makes conscious decisions, but as we will see later there is really no self. A better explanation may be provided by suggesting that we (our memplex) chooses a different careers and we (our memplex) develops differently (different personality) because we have to succeed in the complex memetic world we find ourselves in. If our siblings are good at something this may make us choose to do something else because we feel that as they are taking that niche in society we need to find something different for ourselves.

### The role of interaction with other humans

When we are born, most of the brain is unwired, and this means that much of what we eventually know is learnt from birth. Some of the wiring of the brain is genetic or programmed, such as the basics of our visual system, etc, but even here if we are not exposed to certain things, like vertical and horizontal lines, then those parts of the neocortex (columns in fact) are not developed at all. We have discussed these things extensively elsewhere so will not dwell on them here. The point I was trying to make is that much of what we do learn in life comes from experience and the interaction with other human beings. As noted earlier we are extraordinary copying machines, and we go around copying people like crazy. We copy our parents and other people we play and work with. This is one of the reasons we like our children to play with other children. In this way they can learn things much faster as each child whom they play with has already picked up some memes for their own parents. This saves us having to show them everything and really accelerates the learning process. Also playing with other kids, allows our own kids to develop social skills which are an essential part of living in the complicated memetic world.

## 6. Blackmore's extraordinary theories

Susan Blackmore makes to powerful claims that memes are the reason why we have such large brains, why we have language, why society is so structured, why technology and science has in the way it has, and why we think we have a soul. These are quite extraordinary claims, and in this section we will be arguing in favor of these claims. The argument is that memetic evolutionary pressure drove these factors, but of course, the way that they did achieve this was through the influence of meme evolution on genes and biological survivability. In some cases one can also contrive a biological reason for the evolution of some of these things, and what is probably going on is that both memetic and biological evolution have contributed to these developments, although we think that memes may be the most important driving force behind them.

### The origin of a large human brain

Recently Susan Blackmore has suggested that 'memes' may offer an explanation of why the human brain has evolved to such an enormous size, some 3 times what one would expect for the size of our body compared with other primates. At first sight, Blackmore's claim looks quite extraordinary but there is more to memes than meets the eye. To truly appreciate what Blackmore is trying to say one needs to take what she refers to as the meme's eye view.

Although 'memes', which are defined as behaviours or ideas which are copied from person to person, are probably not the complete answer to this long standing puzzle they offer a more compelling explanation of why we (humans) have evolved to have large brains, compared to more conventional ideas. One theory has it that when we looked like our ancestors the apes we had large bodies but as our organs developed and refined themselves our bodies got smaller and this released more energy for us to utilize, which was directed towards the expansion of the brain. This is a very unsatisfying theory. We will argue below how memes may have once been important in the development of the human brain and that they may be becoming increasingly more important again in the future. We will also point out that other factors, such as the emergence of creativity may have been important in the sudden explosion in human brain capacity.

Anthropologists have been interested in where we have evolved from. The two distinctive features which make us different from other mammals is that we have a large brain and we walk upright (term bipedal). The point about what we were talking about above is why are there not many more species which have a large brain like ours or walk upright. When the ape-like creature "1470" was discovered, dated to be about 2 millions years old, which had a large brain it was thought that this is where we came from. and the 'brain theory' came into being. The brain theory suggested that we became who we are because we "accidentally" developed a large brain, and this then gave us an advantage over other animals. The theory was dismissed when the ape-like creature "Lucy", who was dated to be about 3 millions years old, was discovered. Lucy's spine enter her skull through the base, which suggested that she walked upright, but she had a small brain in comparison. This then suggested that humans evolved to walk first before their brain developed or grew large. So the brain became large after we had already started to evolve. We will see below that memes may have lead to the development of a large brain. Basically the idea is that our brain became large because we needed to develop the ability to imitate, and memes were the driving force behind this. The

discovery of Lucy suggests that human-like species developed before we developed a large brain. The brain theory would suggest that the meme theory explanation of why we have a large brain is incorrect. We walked upright before our brain grew dramatically in size.

The answer to the puzzle of why we have evolved to have such large brains compared to other mammals and animals must have something to do with why humans would need such large brains in the first place, or what extra brain functions humans have over other animals, and how they may have been important in our survival. In respect to each of these additional functions we need to outline what evolutionary advantage they serve. Perhaps the most important attributes of the human mind that are not present, at least in large quantities, in other animals are:

- the ability to learn
- the ability to self-learn, that is the ability to extrapolate, to think, to reason, to generalise, to imagine
- the ability to communicate through language (spoken, written and visual, for example television and internet)

Blackmore has suggested that since most of what we know is copied from others, the most likely reason for the rapid increase in the size of the human brain was required for us to gain the ability to imitate others. Note that one may also need a large brain in order to store all of the information that we need, in order to survive in an increasingly complex world. However, if this was the actual reason why we have evolved with large brains, and not to acquire the ability to imitate, one would have to conclude that our brains must be still expanding rapidly right today, probably at an even faster rate than when it all originally started. This is because we need to know much more today than we ever did in the past. Blackmore also says that memes compete to fill the vacant space in our brains. If this were true then there would be constant pressure on our brains to increase in size. I however believe that memes compete for attention, not space, and there is no real pressure for our brains to enlarge much beyond their current size. The other reason why our brain size may be trying to increase is so that we can think more, which in my language means that there are more available spurious memories, because this is how we think and generate new ideas. It is interesting that the part of our brains, the part of the neocortex actually, that is vastly bigger than in other mammals is the frontal cortex where thinking and planning take place. This may be suggestive that our brains got bigger so that we could think and plan more.

Memes offer a much more compelling explanation of why the human brain is so big compared to other animals and why we have superior mental abilities, compared to more conventional ideas. One theory has it that when we looked like our ancestors the apes we had large bodies but as our organs developed and refined themselves our bodies got smaller and this released more energy for us to utilize, which was directed towards the expansion of the brain. This is a very unsatisfying theory. Why the brain, what happened to other animals, and why didn't the brain shrink in size too? Another theory has it that we developed large brains, as well as language and altruism, through the process of 'sexual selection'. This sort of phenomenon is thought to account for why peacocks have such large and beautiful tails. One would be pushed to explain what biological advantage there could be in having such a large and possibly risky tail. The females have selected male with

beautiful tails because they might feel that their male offspring would then be born with beautiful tails as well and will consequently have a greater chance of attracting females themselves. It is a sort of runaway solution that originally does not seem to have any logical basis. Another example is why do males have beards, the answer might be that females are attracted to beards. You might think that we had hair all over our bodies and we simply lost our hair over our bodies, retaining that over our faces but one should note that the apes, our ancestors, do not have hair around their mouths. Miller ('The mating mind: How sexual choice shaped the evolution of human nature', Geoffrey Miller, William Heinemann Press, London 2000) suggests that this simple phenomenon may be able to explain why humans have a large brain, as females were attracted to male who were of greater intellect. Miller proposes that this may also explain the origins of language and altruism, but there are some logical flaws in this argument. Miller suggests that we give to charities so that we look better in the eyes of our sexual partners, but how would one explain the fact that some people give anonymously, and do not go around bragging about it. To that point how would Blackmore also explain this situation, as her assertion is that we are generous so that we are liked, so that we can spread our memes. Blackmore would say that anonymous altruism, such as donating to starving people in Africa would be something that we may do as a side-effect of copying altruistic behaviour. By the same token we could argue that the same little accidents occur in the 'sexual selection' theory, and that there is also a biological explanation along the same lines. Our illogical altruistic acts are a side-effect of nature's development of guilt, which has many good qualities.

The 'sexual selection' theory is also flawed because most females will pair off with someone, and there is no evidence that those males of females who have better language skills, large brains, etc. have more offspring. Blackmore's theory requires that this initially only happens with people who can imitate best to get the ball rolling, and then memes start to take over, whereas in the 'sexual selection' theory one requires the persistent selection of numerous types of characteristics by this mechanism. The two theories are actually quite similar to each other. In Blackmore's theory it is the evolution of memes which drives the system, whereas in Miller's theory it is the human mind, deliberate choices by the individual, or if you like the 'self,' which drives the system. In reality both of these forces may be operative, with a little extra input from creativity.

The answer to the puzzle of why we have evolved to have such a large brain compared to other mammals and animals must have something to do with why humans would need such large brains in the first place, or what extra brain functions humans have over other animals, and in particular how they may have been important in our survival originally. Some of the most important attributes of the human mind, some of which are related to each other, that are generally not present in other animals are:

1. The ability to learn quickly, particular from each other, particularly by imitation.
2. The ability to interact socially. Some sociobiologists have suggested that humans need large brains so that they can maintain their social contacts. Humans on average keep in close contact with around 150 people, which is much more than any other animal, and it has been suggested that this is why we need a large brain. This may well be so, but it does not explain why we needed to develop such social contacts in the first place. One of the original suggestions was that social behaviour replaced grooming, as is observed in apes, but this hardly accounts for this evolutionary development. It has also been suggested that language is the natural extension of grooming as well, but then one would have to explain why more animals have not evolved language and why we no longer groom ourselves to any reasonable extent. Memetics however offers a much more satisfying answer to this, because we have developed these social contacts in order to propagate memes.

3. The ability to store more information. The amount of information that any one brain can store is limited because memories interfere with each other. In neural network models, networks with  $N$  neurons can generally store somewhere on the order of  $N$  memories. This does not seem to offer much incentive for having a larger brain, because if we double the size of a brain then this just doubles the number of memories that can be stored in it. The number of different possible brain states however, is much larger, approximately going like  $2^N$ . Increasing the size of the brain from  $10^9$  memory storing neurons to  $10^{10}$  results in an increase in creativity (possible brain states) by a factor as large as  $2^{9,000,000,000}$  which is enormous. Taken on face value this might suggest that humans have the potential to be much more creative than other animals, but then again some mammals like whales and elephants have much larger brains than humans.
4. The ability to understand each other, and how we fit in with each other and into the complex world around us. More specifically this ability requires a sense of a 'self'. This is an interesting idea because, other than orangutans, chimpanzees, and possibly dolphins, most other mammals do not demonstrate that they have self-consciousness. As we will see later in chapter 4 however, the existence of a self may also have something to do with our ability to interact socially, and is itself intricately linked with memes themselves.
5. The ability to communicate through language (spoken, written and visual).
6. A large portion of our brain is devoted to the hands (see the figure of the human homunculus in chapter 4). One may argue that this need resulted in the initial rapid expansion of the brain. There was an urgent need for us to use our hand to make tools, weapons, shelter and to prepare food. The part of the brain that really stands out is the forebrain, where thinking, planning and consciousness are thought to reside.
7. The ability to extrapolate, to think, to reason, to generalise, to imagine, that is to be creative.

Most of these abilities have a connection to evolving memes. We will see below that imitation, social behaviour, the existence of a self, and language can all be tied in with memetic evolution.

It is apparent that we do most of our learning from each other, either directly or through the printed or visual media. This offers us an incredible advantage with respect to any other creatures on this Earth. Blackmore and Dawkins argue that the ability to imitate requires an enormous amount of cognitive ability, and it is strange that most other animals do not imitate, bar a few examples to be given later.

As noted above, a slight increase in the size of the human brain can lead to an enormous leap in the creative ability of humans. Creativity is also required for us to copy something useful from each other. That is actually how we learn. Without the appropriate spurious states already in our brains we are unable to learn something new. All we would be able to do is recall memory that had already been stored in it. Blackmore's position on creativity is that memes created it because it serves their purpose. Even if this were true, creativity may still have driven the rapid expansion of the brain. On the other hand, since a small increase in brain size leads to an enormous increase in the potential for creativity it is unlikely that creativity was the driving force behind the great expansion in the size of the human brain. Furthermore, most people are not very creative.

Whatever way we gained large brains, it is apparent that we now need them to understand and live in the complex world around us. Today, we need to know how to drive a car, how to write, how to read, how to speak (and maybe in even more than one language), how to act in front of other people, how to run our finances and businesses, how to do our job, or even how to solve problems in calculus and science. We also need to know things like: how to cross the road, to avoid poisons in the kitchen, not to play with guns, etc. These have a clear biological edge, which suggests that today's society may also be exerting pressure on our genes to expand the size of the brain further. The reason however why we have a large brain has to do with our past, and archeological records show that this expansion took place in our early cave-days. At this time, life was nowhere near as complicated as it is today. In the cave days, we would have probably needed to know how to make tools, especially hunting, how to cultivate crops, how to build a primitive shelter from the storm, what poisonous plants to avoid, and so on. As these are simple tasks compared to what we need to know today, it is obvious that knowledge was not the driving force behind the expansion of the brain. It is also obvious from the fact that the rapid expansion of the brain started in the cave days. This suggests that knowledge and maybe imitation was the driving force behind this. All of this leads us to conclude that information per se is probably not the reason why we have evolved with such large brains, unless our brains are actually growing rapidly right now as well.

Another possibility may have something to do with the fact that humans have a 'self', and that humans not only want to survive but want to be dominant over all other animals, the environment, and their fellow man. The reason why we may need a self is that we need to understand each other and how we fit into the world around us. If this competitive nature was the main driving force behind the evolution of a large brain it would be difficult to explain why we help each other so much, and why we do all of those esoteric biologically irrelevant things. We may of course have realized the benefits of altruism and cooperative behaviour, while deep down we still care for ourselves over anyone else. Blackmore suggests that the 'self' is an illusion (see below) which was created for the benefit of the evolution of memes. ,

The other possibility is that what actually drove the rapid expansion of the brain was the acquired ability of the brain to be able to communicate with other people. Without such an ability it is difficult to spread memes in significant quantities to generate any memetic driving. In the early pre-language cave days, we could have copied each other by looking at others making tools and fires, but without the ability to be able to freely communicate with language. At this time, memetic driving may have been an insignificant force. Language could have developed (almost) by accident, with a few groans and moans eventually accepted by most of us to mean something in particular, and this may be the memetic reason for the sizable expansion in brain size. As language however does not occupy such a large portion of neural tissue this is unlikely to be the reason behind its expansion. One could suggest this as a memetic reason for the rapid expansion of the brain, but the bottle-neck has been shifted from the ability to imitate to the ability to communicate. Without memes, we would not want to communicate with each other so much, if at all, especially with people to whom we are genetically unrelated to. Blackmore argues that language evolved as a means to aid the propagation and evolution of memes, and this seems to use to be a more sound point of view to take.

Another possibility is that we just developed a large brain by some freak accident, and then having such a large brain gave these being exceptional capabilities to survive, or maybe these people

thought they were so superior to other less intelligent species (as we do now) that they decided to kill them off. The main enemy or predator of humans are humans themselves. Human history is spotted with acts of gross extermination and racism, so this reasoning may not be as absurd as it first appears. Such mass killing may also have been linked with 'religious' beliefs, or other beliefs that united one group of peoples against others. It is odd that of all of the Homo species that once lived on this planet that the only survivor was Homo Sapien. One could think that somehow, somewhere one of these other species may have survived, not that we know for sure that they did not. This suggests to us that something like a race war may have been involved with the gross slaughter of most races by Homo Sapiens. And what happened to the Neantherals? They had a larger brain than homo-sapien, but maybe it was not developed for thinking and planning, or maybe humans killed them as they were seen as competition.

Another reason why we may have large brains is that we have a purpose of discovery, a religious quest for understanding the world around us, that we are special in the eyes of 'God'. This is however a very unsatisfying explanation from a scientific point of view, but we thought we would mention it because some readers may imagine there was some truth in it.

Another less likely possibility is that we were visited by extraterrestrials, who somehow manipulated our species to give us large brains and exceptional capabilities. This is unlikely to be the case as even the neantherals had large brains, and our brain structure is similar to other mammals except for its size and a much larger prefrontal cortex.

Note, in order for the memes to cause something like the increase in brain-size in humans, and to lead to the development of language, they would have to had an influence over the genes in some way. Our brain-size doesn't just increase because memes want us to know, acquire and transmit more information. There must be a direct action in some way that allows those with more memes and the capacity to imitate, to have more offspring, who are more likely to survive.

As noted previously, some animals also demonstrate limited capacity to imitate and a direct link between the level of imitation and brain size could be used to test Blackmore's theory that the need to imitate led to a large human brain. We are certainly the best imitators, while some of our closest ancestors, like the chimpanzee, which have fair sized brains also demonstrate some imitative abilities. As noted earlier, dolphins, which also have large brains have shown such abilities.

On the question of brain capacity, from a neural network point of view the brain can store around  $10^{14}$  bits of information. von Neumann suggests that we process and need to store about  $10^{21}$  bits of information in a lifetime, but this is an over estimate because we do not store the complete history of neural activity. Most likely we only store information after our brain has reached an attractor, which probably happens on the order of every 0.5 seconds, compared to the neural update timescale of about 0.001 seconds. Even then we do not store most of the attractors that our brain converges to. Lots of information is clearly store in short-term and working memory and is disposed of every few to tens of seconds. Landauer has suggested that the learning rate in humans is much slower. These estimates were derived from seeing how many pictures and words his subjects actually did learn. Based on this research Landauer concludes that we only learn about  $10^9$  bits of information in a lifetime which is much less than the von Neumann estimate. There is also good reason to believe that we also dispose of old memory that is no longer useful to us, and synaptic bounds may naturally result in palimpsest type memory. If we accept the Landauer estimates that neural networks would seem to have unlimited capacity to handle the information it will acquire in its



lifetime, it stands to reason that the brain did not grow to its enormous size because of the competition between memes to enter the brain and the need for more information. Blackmore suggests that the need to be able to copy was actually what drove the rapid expansion of the brain.

If the brain does have unlimited capacity then it also follows that memes do not really compete for space in the human brain, as is suggested by Blackmore. In fact, if our capacity is so great, how do memes compete with each other. They compete for human attention. Although our capacity for information is essentially unlimited (see also the discussion below about the number of available states in the brain) memes compete for our limited attention, and limited learning capacity. What memes have done to the brain is turn it into a machine which can process and propagate information rapidly. Memes are competing to get recognized by us, because if they do they have a greater chance to get passed on to others, and greater chance to be depended by ourselves (personal memes).

One can also argue that since we need to know so much more today than we did in the cave days, to live in today's complex society that it is unlikely that memes per se were the reason why we humans developed such a large brain in the first place. If our brain grew to take in the vast number of memes it required then, then our brains would be bursting at the seams today.

### The origin of language

Our ability to communicate (through language or otherwise) with others is clearly beneficial for the spread of memes, and from the meme's eye view, as Blackmore puts it, the evolution of memes would seem to want to favor the development of such a system. Blackmore has suggested that this may well be why language has evolved in humans. This is another one of those long-standing unresolved puzzles in neurobiology (why did language evolve?) for which memes offers another simple explanation.

If you stop and think about it, language must have come about as people started to make sounds, which symbolized certain things, and these started to become accepted as the word or sound to carry that meaning. As language evolved more and more words came into being until we evolved to the present language that we have. This is reflected in the fact that words are defined in terms of each other and one difficulty that children have with language is that some words for them are defined in terms of words they have not yet encountered. This is because their journey of learning a language does not necessarily follow the same path as the path of language evolution. Of course different languages evolved in different places and this is why we have so many different languages and dialects. So it seems that languages evolved as people interacted with each other and came to accept certain words to mean certain things. It is known however that the human brain seems to be natural adept to learning words, phrases and syntax, and the key question is did memes 'force' the brain to evolve so that it could perform these functions. That is difficult to answer, but one around this problem is to suggest that most other animals may also be able to learn languages, indeed some chimpanzees have indeed been able to learn primitive form of language, and that what enables us to learn languages is the fact that we have spurious memories. As other animals also have spurious memories, one would have to explain why they are not so easily able to learn languages as well, and one possible answer to this could be that spurious memories are only formed based on what is already known, and humans have an unlimited amount of information available to them in order to be able to learn things like this. However it is also clear that the human brain is in some ways quite special in that we are able to learn a lot more when it comes to languages than say chimpanzees, and

so part of our ability must have evolved in some way. Meme theory suggest that memetic driving, or the pressure exerted on biology by memes may have led to this ability.

It is also interesting to note that humans are practically the only animals, who can imitate so broadly and who have extensive language systems. Some other intelligent animals such as the chimpanzee, the dolphin and whales are also known to have more primitive language or communication skills and to also demonstrate small levels of imitation. A direct link between the level of imitation and language in other animals may also offer some support for Blackmore's hypothesis that language was induced by the evolution of memes.

Humans also have a capacity to learn language far more easily than other animals. For example when chimpanzees are taught English, they can generally only learn a handful of words and they find it difficult to put words together into grammar. ## There are some examples of gorillas and ? (wasim, koko) who have learnt sign-language, but they are only able to learn a few hundred words and their ability to string these words together into meaningful sentences is quite restricted. A young human child on the other hand can generally acquire this ability masterfully in a matter of a couple of years. This suggests that human minds are naturally adept at birth, or have the required neural network hardware in place at birth, to learn language easily. The question is why have we evolved with this variation in the structure of our brains, whereas other animals have not. Blackmore suggests that the reason for this is for the benefit of the evolution of memes.

Memetics also offers an explanation of why we talk so much, and tell other people so much of which may be construed as a survival edge for ourselves. Some people just cannot stop talking, especially teenagers and women. And what is more, most of what we talk about (about two thirds) is just useless gossip, or information about others. One could argue that this gives us potentially useful information about others so we are better prepared when we meet these people who are the subject of our gossip, but this does not explain why do we talk about people (like the president of America) whom we do not even know. One would also have difficulty explaining why other animals have not evolved with language capabilities, if gossip was so important for our survival. Some gossip may be actually important for our memetic survival but most of it is just that gossip, which is transmitted for the sake of transmitting memes. As noted earlier, from a biological point of view it is not really in our best interests (for our selfish genes) to talk with others as much as we do. Although there are some biological advantages in sharing and being cooperative, it would be difficult to explain the levels of sharing and conversation and type of information that we transfer in such transactions.

Memetics also offers an explanation of the evolution of language, and the sophistication that it has acquired. When language first started we might have moaned or groaned to each other, or just used a sign language, and eventually we started to make rules, or accept as a collective, that certain sounds mean certain things. The evolution of memes, and the desire for memes to propagate as widely as possible has forced this primitive system to evolve to what it is today.

There is much more to language than just the spoken word, and it can be argued that the evolution of memes has also lead to the development of the written word, and the construction of grammar, and the continual evolution of these systems as well. Words can also be seen as digitized units of information transfer between humans, just as genes are the digitized units of transmission in biological evolution. This helps to quell criticism that memes do not have sufficient fidelity to constitute a true evolutionary system.

It is also interesting that so many different languages have evolved relatively independently from each other. We believe that this supports the idea that memes, or the general exchange of information between humans, may be responsible for the formation of these systems.

One needs to be a little careful about these claims, because language can be argued to have an important biological function, because we can help each other to survive against other animals and species. With language we can warn each other of impending danger, but what biology cannot explain is why we as humans have so much language, why do we write poetry for example, and if language was truly a biological development then why do other animals not have a more sophisticated language system. Why are we so different? Also, biology would be pushed to try to explain why we talk about the things that we do, why we talk too much (for example gossip), and why we would want to help each other, by freely exchanging information, to the extent that we do.

Language, and the written word, particular with the ability to record information on paper, and not just in the human brain, has greatly aided the spread of memes further, and has also enabled humanity to store and develop much more complicated memplexes (like our legal, political, medical, scientific, and financial systems), that are important for the development of our societies and culture in general. These developments would have also accelerated our cultural development.

Following the written word, has come the digital revolution in which we are now able to record and more easily access even larger amounts of information. We will take up this discussion below when we look at how memes have driven technology.

### The origin of culture and society

Human culture and the way that human society works may seem to be obviously much too complicated to be the product of the evolution of memes, but one should note that that is all culture really is. It is a collection of ideas and things that we have done and things we believe in collectively as a human species. Culture is stored and processed in human brains. All that we have has been built up from the evolution of all of the ideas that came before, that we have thrown around between each other and let evolve and be molded into what it is today. That is what culture is. This includes all forms of culture from political to religious to historical. Our social and cultural development has been greatly enhanced by our ability to store information in not only human memory, but also in other sources, such as in words, books, photographs, film, video, records, magnetic tape, compact discs, and on computers, and by our ability to freely distribute this information onto others, by voice (with words, sounds, songs, telephones), visual images, faxes, electronically, or through the Internet.

I would suggest that if it was not for the ability to store information in some of these other guises, it may not have been possible for us to develop such a rich human culture. This is probably also why some of our greatest social and scientific advances have come in the last century or two. It also appears to be essential that many

humans work collectively or collaboratively on some of these systems or problems, as they are too large to be understood, developed or solved by a single person. Humans recognize the fact that they need to share information and work together to a certain extent for our survival as a race. By the same token, we do not individually have to know everything; we can look it up (in a book or on the internet), when we want to, or we can get someone else to do it for us who understands those memes better than us. In the case of the law, which is much too complicated for any one person, we all have access to it through the police, lawyers and the courts. No one individually, not even a learned judge, really understands how the legal system works or should work. There are many different areas of law: criminal, business, financial, civil, pertaining to land ownership, international, to name a few, for someone to understand them all, and furthermore all of these systems are also evolving in complex ways. This evolution is also driven by many specialized professionals. We do not even understand (from a scientific point of view) how some of these complex systems evolve.

Certain decisions and laws are also made by humans collectively. Councillors make decisions about local land use, politicians make rules and laws about how we are allowed to act, and the United Nations makes rules and laws about how different countries are allowed to behave.

Boyd and Richerson (“Meme Theory oversimplifies how culture changes”, *Scientific American* October 2000, pp58-59) question Blackmore’s theory that the evolution of memes (beliefs and ideas) can account for cultural change. They suggest that one needs to take into account the human mind (psychology) and the transformation (or mutation) of information, during the transition from person to person. We agree with this view, however we feel that errors in transmission are considerably reduced in more recent times, because of the advent of other mediums for the storage and transmission of information that is far more accurate, such as digital information. We would also suggest that human creativity needs to be taken into account because memes are heavily manipulated in the minds of people, and new ideas emerge in this way. I think that we probably all accept that the Blackmore/Dawkins/Dennett theory that memetic evolution controls cultural changes is a decent first approximation to what is going on. No one disputes the need to take into secondary factors when actually modelling this situation. We will also see later that the human mind is itself just a memeplex, and given that the mind seems to be an illusion, when we think we are actually doing something, all we are doing is acting out our life-long accumulation of memes.

It is clear that, although some aspects of society and culture may have a biological origin or need, such as the need to develop laws, for the protection of all humans as a whole, there are many aspects which do not fall into this category. For example why do we need so much art and music, and why do we so freely give information to others. One could argue that we do some of these things, but not all, such as teach at schools and universities, in order to make a living, as then someone else will grow

food for us and perform services for us. We have argued here that many of these aspects of human behaviour have a more natural explanation in terms of the evolution of memes, as a result of memes 'wanting' to propagate themselves as much as possible.

Finally, the skeptic may say that other animals also display social behavior. Chimpanzees and gorillas, even ants and bees, have social behavior and act cooperatively. There are benefits for species to do this. Indeed one time I saw an ant fall into an antlion trap, which consists of a conical sandpit built at the angle of repose. I then observed other ants come to its rescue. Why did they do this? The ants formed a chain of four ants to reach the ant that had fallen in the bottom of the pit. In the process of rescuing this ant, one of the rescuers fell into the tarp, and the remaining ants saved it as well. Even though other creatures demonstrate social behavior, this is nowhere as profound as in humans, and we are not arguing that all of our social behavior is driven by memes. Biology plays a role in our social behavior, instinctual behavior (genes) influences memes, and memes and genes co-evolve. What is clear however that the amount of cooperation and social behavior in other animals is nowhere as profound as it is in humans, and it stands to reason that the major driving force for this is memetics.

### The origin of the self

Understanding consciousness and self-consciousness has preoccupied humankind for centuries, maybe even millennia, and yet very little progress has been made on this elusive topic. After Freud's work in the early 1900's, theoretical and experimental scientific work on consciousness was abandoned for around 50 years, only to return to it recently in the last 10 years or so, but progress has still been scant. Most neuroscientists would agree that consciousness resides somewhere in the brain, and some scientists (Crick and Koch) have started the search for the neural basis of consciousness. Crick and Koch, for example, are trying to pinpoint the specific neurons which become active in the brain of a chimpanzee when it realizes that there is a duality in an image which is presented to it. This phenomenon is called binocular rivalry. The situation is similar to the classic picture in psychology where two faces are facing each other, but can also be seen as a vase in between the two faces. When you look at this picture you will either see one or the other, and your attention periodically shifts from the two faces to the vase, and vice versa. A similar situation occurs when one looks at a stick drawing of a cube. Depending on which face the observer takes to be the front face, there are two possible cubes represented in this drawing. Crick and Koch have suggested that consciousness may take place when all of the neurons synchronise their firing rates at 40 oscillations per second, but this is only a hypothesis. So far their research has not been able to locate consciousness in the brain, and many scientist believe this is futile. See chapter 4 for more details.

One of the main problems with understanding consciousness is that it is difficult to define what consciousness actually is. It is subjective to the extreme. We all seem to know what consciousness is, we often talk about it, but for some strange reason we are unable to quantify what exactly it is. If we could the search for the soul would much easier than what it is. Roughly speaking consciousness is the awareness of what is going on, but who exactly is the observer. If you imagine that what you see is represented as on a screen in your head, the question is who is observing what

is on this screen. Then there is the question of self-awareness or self-consciousness, in which case the observer is aware that he or she is actually aware.

As we will see in chapter 1, Libet et al have demonstrated through ingenious experiments that consciousness seems to be just an after-thought which the brain somehow generates and maps backwards in time so that we think that we actually decided what we have done. If this viewpoint is correct, then it would suggest that we act without any real will or self control. We are just like robots reacting to new input as it impinges onto our nervous system. The way that we act depends on our memory store, previous experiences, and our memes. This view that consciousness is an illusion holds some appeal as it explains our lack of success in understanding consciousness and our inability to describe to each other what it actually is. The same applies to self-consciousness or the so-called 'self', which in broad terms is the knowledge that there is a 'self' that is conscious of what is going on. In other words we are just automata, reacting as we go along, only becoming aware of our actions and decisions a short time after they have already happened. The brain deludes us into thinking that we made the decisions to perform those actions. One may ask why the brain gives us this illusion, and a possible explanation is provided by memes.

Is it true that we are working for the evolution of memes and not ourselves? You would have to wonder seriously about this when you think about what we do. We are all busy running around transmitting (eg gossiping) and copying memes, scientists spend their lives trying to uncover the memes (secrets of knowledge) of Nature, politicians trying to find the memes of equality (or inequality for some), health researchers trying to find cures for diseases and bodily functions, even househusbands (and housewives) are busy collecting and transmitting memes about food cooking, food storage, better ways to care for the family in cleanliness, etc., workers collecting new memes on the latest techniques in their areas, for example a new way to stick (as opposed to nailing) an iron roof down, new tools for doing jobs more easily.

Previously we have defined consciousness as the recognition that certain attractors have formed in the brain. It follows in this paradigm that consciousness is an observational property of what has happened. Self-consciousness can broadly be defined then as a model of ourselves in relation to our model of the rest of the world around us. If this viewpoint is correct, then it would violate the physics law of causality to think that we can influence our actions.

The whole question of why we may need self-consciousness is also quite puzzling. If we envisage brain function as neurons reacting to incoming signals, and if we suppose that self-consciousness is just a higher level process, that observes what is going on in our brain, it seems odd that we would need such a thing. Why don't we just act out what our neurons have already determined as our best action or reaction, why do we have to wait upon some other higher-level neural process before we do something? This would only slow things down. This process is itself just a neural process so why would we need it at all. Why can't the original neurons do the whole calculation in the first place? Why do we need to know? And what is "we" in any case? In other words, why doesn't the brain just act things out without "us" having to know.

Blackmore plays on this commonly held view that consciousness, and in particular self-consciousness, is just an illusion and comes up with an argument of why it may have evolved based on memes. Most people would accept that only some advanced species of animals, such as mammals, may have consciousness and that we (humans) are possibly the only animals with self-consciousness, or self reflectiveness. Experiments with mirrors, where an animal is observed to

determine if it knows that a spot has been placed on its head, seem to suggest that only orangutans and chimpanzees have self-awareness, whereas the situation with dolphins is unclear. As with the other main unsolved problems in the evolution of the human brain (such as why the human brain is so large, and why we have such a sophisticated language system), Blackmore proposes that as self-consciousness is unique to humans then maybe it also has a memetic reason for its existence.

According to Blackmore, the self is just a giant memplex, and the belief in an “I” was created to defend and propagate its own memes. We often argue from our own personal viewpoint, as I am in this book. When one says “I believe that...”, or “I think that ...” they are protecting their own memes and trying to convince others of their validity and usefulness. In this theory there is no human mind, no free will, it is just a collection of memes, we act without thought or free will, and we are deluded into thinking that there is a self, because this aids the spread of memes. This is a fascinating perspective to take, that may sound a little weird at first, but it can explain much of what we do and why we act the way we do.

The problem with this is that although some memes may benefit from this self centred behavior, on average memes will not benefit as a group by this, as they are all competing for the limited attention available to humans, so this does not really explain why a self needs to have evolved. The answer to this question may have something to do with the competition, which aids the betterment of memes. The situation is akin to how the arms race results in the refinement of weapons even though there is a limited amount of arsenal required.

The story gets even more interesting if we think about how we come to believe in a self. As children we are often told about the self by our parents and relatives. This is how we develop our own illusion of self. When we ask questions like, “Why did YOU do that?”, or “What are YOU thinking about?”, we are propagating the myth of a self. Why do we do that? I would suggest that we do this because, if our children have a self they are more likely to protect, cherish and propagate the memes which we pass onto them, and in this way we are passing our memes, as well as our genes, onto our children. Furthermore, if this is a valid point of view, it means that we develop our personality, which is essentially our self, during this period. We also like to spread our memes onto our children because they have friends similar to themselves who are also impressionable and this would enhance the prospects of spreading our memes even more. This is one of the reasons we seek desperately to see that our children get a good education, not just for their financial future but also for their strengthened ability to spread memes. This may also explain why couples who have separated fight so desperately to get custody of their children. Their children represent an important part of their memetic future. Both parents know that generally their children will be in good hands with the other parent, but they would like to have them because they can then propagate their memes.

According to Blackmore and others the self is just collection of memes, a collection of life experiences, a collection of memories. Everybody has their own set of memes and beliefs (which are also memes).

#### Passing on the illusion of self

In this scenario the “self” is installed in our heads from an early age by the constant reference to it by others when we are young, and everything that we know about the ‘self’ has been derived from

this interaction with other people, copying, what they all believe, that there is a 'self', but we have all been fooled by our peers to believe that it is true. And, once this has been installed in our brains, it is difficult to convince ourselves otherwise, as memes benefit from maintaining this illusion. A similar phenomenon takes place with religion, another memplex. The delusion that there is a self would explain why science has been unable to explain what it is, let alone define it objectively. I

There are two problems with this view. If the self exists to defend its own memes and if everyone is defending their own memes, then what possible benefit could this have for memes in general. If memes are competing to get into the limited space inside our brains, as Blackmore suggests, then how do memes gain for this on average? Memes that make it, make it at the expense of others. One possibility is that memes prosper through this intense competition, as only the best memes will survive. The other possibility is that, although the storage capacity of the human brain may be limited, the number of possible (creative) brain states in the brain is essentially unlimited (???)

Secondly, if the self is an illusion as suggested by experiments, it could still have a biological purpose. The existence of self-consciousness enables us to understand how we fit in with the rest of the world around us, and in particular with other people. One could also argue that even if memes did come up with self-consciousness, once it has developed, it can set its own agenda, some of which may have a biological edge.

In spite of Libet's findings, it is also hard to believe that there really is no self, no central control somewhere, no "I", no little man inside of us telling me what to do. As noted earlier, it is difficult to convince people there is no self as memes protect its illusion, as they benefit from its perceived existence. Experiments suggest quite clearly that consciousness is an illusion, and science is unable to locate the self inside the brain. It is interesting to note that sometimes the self is not even located in our heads, as we can imagine that it exists in our fingertips (if we are doing something with our hands), and, as Blackmore suggests, sometimes it can inhabit the bumpers of our car when we are driving. We shriek if the car's bumper goes too close to another car. Where is the self in these cases?

### Competition between memes to get inside your head

Blackmore says that memes compete to get into our heads, so they can live and so that they can get transmitted to others. She says that they are competing to get into the limited space available in our minds. If this is the case it is difficult to see what overall benefit there is to memes because one meme's good fortune is another meme's death. One way that this may work is that they may still better themselves through the competition itself. Another possibility is that the available space in the brain is greater than anticipated. Although the storage capacity of the brain is limited to some  $10^{14}$  bits of information, it has been estimated that we only need around  $10^9$  bits of information in a lifetime. We also saw before that the total number of available states in the brain is much bigger than this, with something like  $10^{4,000,000,000,000}$  possible different states. This is an estimate of the number of different bits of information or memes that can be generated in the brain.



Blackmore even presents the argument or scenario that human self-consciousness may be an illusion for us to propagate memes further. From a meme's eye view this can be argued quite well, but we would maintain that memes are also largely stored and tested in the human brain and hence the human brain also controls memes.

### The origin of creativity

Our ability to understand and to think are also related to memes. Our brains are not only good at copying and transmitting information but also at taking ideas and manipulating them in our heads. If memes are responsible for the self then one can also suggest that memes give us the ability to understand. Memes rely on the brain's ability to generate new ideas, as this is a desirable process for the evolution of mems. One may then ask if this ability in humans was sharpened by memes. . As we will see later, the processes of generating ideas and thinking are closely related to our natural ability to generate new states of information. Other animals also have such states but humans seem to have an uncanny ability to generate new ideas and solve problems on the go. The question is how much of this is related to our copying ability (we are encouraged to be creative) and how much to our ability to share information. More shared knowledge, and discussion with others, makes it easier to assess the merit of ideas.

### Other subjective experiences

In addition to the 'self', memes may have aided the development of other illusions, such as 'pleasure' and 'happiness', and other emotions, as they are also defined for us by others at an early age. Just like we may define what the self is in our children we also define emotions. We agree on what these things are just like we agree on what is red, although there is no reason that we see the same redness in red as others. Even though these attributes of brain function may have a biological purpose to them, as most animals also seem to have emotions, there is good reason why they may also have a memetic side to them, and their existence have been more directly driven my memes. Emotions clearly also aid the spread of memes, and like consciousness they are difficult to define. Emotions like anger, love and pleasure help spread memes. We may like certain things because they are useful for our biological survival, and also because they are useful for our memetic survival. My wife always tells me that you feel like eating something because your body needs it. Although I partly agree with this viewpoint, it would be difficult to explain why I like eating so much pizza and chocolate, and why are we so heavily influenced by advertising, particular in relation to fast foods.

As happiness is something we tend to want to especially give to or share with our kin so it probably has a genetic or biological component to it, but once again this may have originally tied in with personal memes as these are the ones we would have shared originally. Pleasure and happiness are useful for the spread of memes. Happiness can reasonably be described as a state of the human mind in which the subject is more receptive and outward, a state which ideally suits memes, and their propagation.

As pointed out previously the self is just a bunch of memes. When someone receives the wrong memes as a child this could lead them to crime or psychotic behavior. If one's memes get all screwed up, the self does not develop properly and this could lead to madness.

Lying is a strange behavior where we deliberately spread false memes. This suggests in itself that there is a self, but then again we have chosen this action automatically, only to delude ourselves that we actually decided to do it. What is the purpose of lying? It could result in a biological advantage, we could trick someone who was going to harm us. It also serves memes in that it helps generate more memes, and it could serve the self for selfish reasons.

If the self is real, we may do things for the self, such as for its happiness, but by the same token happiness may be a meme just like the self that supports the self itself and the things that an organism does. Happiness is a state of human mind in which the subject is more receptive and outward, a state of mind that suits memes and their propagation. In the same way that the self may be an illusion, happiness may also be an illusion, but since happiness is something we try to give ourselves and our kin then it also has a genetic origin to it (just as the self does too), so has a biological relevance too.

## 7. The role of creativity

Spurious memories allow the brain to make advances in knowledge based on known information. In order for advances to take place, or for spurious memories to be recognized as being something useful or creative, one need to assess their merit with respect to known knowledge. This take place within the brain generating the idea, but consulting existing knowledge and literature or by interacting with other people. This is why other animals cannot make major leaps in knowledge. They do not have the required knowledge there in the first place.

If we all just copied then where do original ideas come from? They could arise out of transmission errors between humans, and probably a considerable amount of creativity is probably generated in this way. We make errors and stumble onto new better ways to do things. In fact most discoveries seem to work in this way. One could argue that the brain plays an important role in the process as it makes errors in transmission and reception. In other words, it is important that the brain is an inexact coping device. It may also be important that we are all different in some way, so that we interpret the same situation differently. This could lead to alternate descriptions of our surrounding, one of which may be superior to others and once recognized by a group of people, or by society, is then accepted and used. It is often not clear however at all when something important has been discovered. Many great ideas are originally greeted with skepticism and fervent opposition. Some great advances also seems to involve a array of different inputs from many people during their evolution. In this chapter we will show how it is that the brain can come up with creative ideas, and how it is that it actually makes mistakes which are important in the evolutionary process.

### Create and copy

Blackmore has suggested that the need to copy each other may have been to main driving force in the sudden expansion in size of the human brain and once this was established it started memetic evolution. Before we can copy something however we need to have something to copy, and hence creativity plays an important part in this initial surge in brain size. We will however agree with Blackmore that the ability to imitate , and not creativity may have been the actual reason why the human brain suddenly increased rapidly in size.

Mutation is instrumental in an evolutionary process. Without any variation, we would just be producing and copying the same ideas over and over. We will see below how it is that the brain can take ideas and combine them in way so as to generate something completely new. The key feature of brain function that allows this to happen is that memories are stored in common areas in the brain, sharing

neurons and synapse (the places where neurons communicate to each other).

### How the brain generates creative states

Memories and ideas are stored in the brain as certain stabilized patterns of active or excessively active neurons, often stored in semi-specific areas in the brain. Images or visual memories are for example stored in the visual cortex and sounds are stored in the auditory cortex. Some memories are stored in a number of cortices. The way that memories are recalled in the brain is quite different to the way it is recalled in a conventional computer. In a computer every memory is stored in a specific location and has a specific address, which the programmer or computer program can use to retrieve this memory. Memories in the brain are however recalled from imprecise input, which closely resembles the stored memory. What happens is that the neurons work collectively to recall the stored memory. This is referred to as content addressable memory, because it is the content of the input that recalls the memory. This is how for example you are able to recognize someone whom you know even though they do not look exactly the same as the when you last saw them. Content addressable memory works because memories are stored distributively in the brain utilizing many neurons and synapses (the places where neurons actually communicate to each other).

One can think of the memory and ideas stored in the brain as a landscape of hills and valleys, with the stored memories corresponding to the biggest valleys. When an input is presented to the brain which is close to one of the stored memories it will proceed down slope until it settles in the nearest valley on its downward path. As long as the input is not too different to the stored memory, the stored memory will be recalled. However if the input is too different to the stored memory, the memory is not recalled. This would happen if the person whom you are acquainted with looks vastly different to when you last saw them. In this case the person will appear to be unfamiliar to you. See figure 7.1.

What interferes with the recall of stored memory are 'memory' states which are naturally generated in the brain as a result of the distributed overlapping storage of memories in common areas utilizing common neurons and synapses. We will call them memory states because as we will see they are similar to actual memories, although they are not formally stored in the brain. These memory states are referred to as 'spurious memories', as they interfere with the ability of the brain to recall the stored memories. What happens is that sometimes an imprecise input converges to them instead of to an actual stored memory and this prevents the recall of the stored memory. Spurious memories have been observed in mathematical models of the brain called 'neural networks', and there is every reason to expect that they also exist in the brain. For many years, since their discovery in 1983, and even persisting today, most researchers have been particularly interested in finding schemes of memory storage and processing that eliminates or reduces their effectiveness. One should however keep in mind that the brain is not a precise recall device, like a tape-

recorder say. It does make mistakes, and often does not recall the true stored memory. We think it is not appropriate to eliminate all spurious memories, and as we will see below spurious memories may well be essential for the brain to function autonomously and generate new ideas.

One of the reasons why researchers wanted to get rid of spurious memories, hence their name, is that there were so many of them and they were symmetrically related. Spurious memories are generally comprised of combinations of features the stored memories. An example of a spurious memory is shown in figure 7.2. The number of spurious memories grows exponentially fast as we stored more and more memories in a neural network. In a well-known neural network called the Hopfield model, with  $p$  stored patterns, the number of spurious memories goes like  $3$  raised to the power of  $p$ . For  $p$  equal to  $40$  this corresponds to over ten billion billion spurious memories. Without any intervention the rapid growth in the number of spurious memories causes the neural network to 'overload' and none of the stored memories can be recalled at all.

One of the main reasons why there are so many spurious memories in simple neural network models is that there is a lot of symmetry in these models. When one relaxes this symmetry, which is incidentally not present in the way the brain is wired and the way that memories are actually stored in the brain, the number of spurious memories is significantly reduced. Incorporating other neurobiological features also has the effect of reducing the number of spurious memories and removing much of the symmetry among them. We are then confronted with the situation where instead of an overwhelming number of spurious memories, we only have a small number of them. These spurious memories can in this situation be extremely useful, as we have suggested elsewhere. For a start they can allow the brain to make mistakes and not to recall stored memories all of the time, which is something that does happen in the brain. Secondly spurious memories may be how the brain generates new creative ideas. It is particularly interesting that many psychologists have previously remarked that creative ideas seem to be closely associated with stored memories and knowledge, and since these spurious memories consist of combinations of features of stored memories they are a natural candidate for creativity. We will say more about this in a section below.

Spurious memories may also be essential for the brain to be able to learn by itself and to function in an autonomous manner, or that is by itself. In neural network models, researchers normally store memories in them by explicitly adjusting the links, or the synaptic strengths, connecting neurons. No-one does this inside your brain. Instead what happens is that the brain learns on its own. How can this happen. I have suggested in my first book *Memory and Dreams* that the brain may learn one of these spurious memories. what this means is that the brain on attaining one of these states strengthens it and converts it into a stored memory. From what we know about the brain this seems to indeed be the case. It is known that whenever the brain converges to a pattern that reverberates the links between neurons that are firing concurrently is

strengthen. This is known as Hebb's rule, after Donald Hebb, a Canadian psychologist who first put forward the idea. If this is true, then the brain goes around learning its own reverberations. This idea is interesting for two reasons. Firstly it means that we can only learn something if we already know something about it. This is because spurious memories consist of combinations of features of actual stored memories. You could hardly for example learn something deep about quantum physics if you did not know something about the subject in the first place. Secondly, and this may sound a bit weird (but I stand by its implication), everything we are about to learn is in a sense already a 'memory' in the brain. All the brain does is 'recall' this spurious memory and then strengthen it.

The way the brain goes around functioning and learning by itself, without any need for external supervision is to learn its spurious memories whenever it converges to one of them. This may have profound implications to how we may be able to build systems with real artificial intelligence, that do not require any external supervision. Most AI systems seem to require that there is some sort of central control, like a program, that keeps everything in check. Our spurious memory model, where the system learns states that it naturally generates itself, requires no supervision at all.

If you continue to practice and explore something you invariably get better at doing it. There are two ways in which the brain does this. Some instructions get programmed or hard wired in the brain. That way you do not have to think about them so much, which means that they do not have to enter consciousness, which slows things down. The other way that one gets better at doing something is to generate spurious memories, which short cut the process and lead to new and better ways to get something done. This is what you do when you learn and create music, playing a guitar, learn how to skate on a skateboard, or even write, for example. Some processes are converted into long-term unconscious processes and proceed automatically without much attention, whereas you also need to generate new ways to short cut and improve and refine your methods. This is where spurious memories play their part.

It is also known that spurious memories help the brain to generalize and categorize, and they may also be how we actually think and combine ideas in our head. They are already states which mix ideas together. For the present purposes our most important suggestion is that spurious memories may be the basis of creativity in the brain, and how the brain is able to generate new ideas.

#### The nature of creative ideas

If creative ideas are generated by spurious memories, then it follows that they are comprised of features of the memories they are constructed from. This means that creativity is based on knowledge, which in essence flies in the face of Einstein's claim that "imagination is more important than knowledge". The brain learns new information autonomously. We have surmised that the only way it can do this is to strengthen existing spurious memories. This means that we can

only learn something that is in a sense already in the brain. This sits nicely with the fact that we can only generate ideas and learn things based on our knowledge. No one every comes up with an idea about something they know nothing about and ideas usually combine various facts together to generate something new. This has a profound effect on the evolution of memes.

As noted earlier, most animals have spurious memories and hence creativity. They use these states, as we do, to adapt to an ever-changing environment. What is true however is that we are much more creative than other animals, and the fact that we share and process so much more information helps us generate even more creative states, as creative states are comprised of other memory states.

It has been suggested to me that females are more creative than men, but I would imagine that what they mean by this is that they are more artistic, whereas men are more scientific and logical. I would question this on the grounds that I believe that doing mathematics and the like is a very creative process. I believe that mathematics and science are very creative disciplines. You rarely solve a mathematical problem by using facts, but by generating new situation, new possibilities by using known facts, and I have suggested here and elsewhere that this is implemented through the use of spurious memories, which are the cornerstone of creativity. And if creativity is linked with spurious memories I see no reason why they should be stronger or more prevalent in a female brain compared to a male brain.

### The evolution of ideas

As noted earlier no one is truly original, even great ideas are based on previous knowledge. Spurious memories offer an explanation of this because they are constructed from combinations of features of other memories. What is also true however is that no man is an island, in that good ideas need to be developed by many people before they are finally conceived to be great ideas. Sometimes inventors do not even realize the importance of their ideas. The mathematician John Nash, on who the movie "A Beautiful Mind" was based won the Nobel Prize in Economics for his idea about equilibrium points and many people could benefit by sharing, did not realize the significance of his ideas.

Ideas evolve in our heads and as they are passed on from one person to the next. Errors in transmission, caused by misinterpretation or inaccurate explanation can lead to a new idea, but spurious memories are essential for this process. Neural systems are naturally equipped with the capacity to absorb error. This is how content addressability works; for example we recognize someone we know even though they may look different to when we last saw them. The only way that neural systems can make errors is through spurious memories. Spurious memories are a natural consequence of the distributed storage of memory in the nervous system. They result because different memories share common neurons and synapses. These new memories are the basis of our creative ideas and are required when we learn something new, and are how the brain makes mistakes. When someone makes a mistake in interpreting something that someone else said, or when a novel idea is generated in someone's head this involves spurious memories. Note also that the usefulness of spurious memories can also be ascertained by comparing it with other stored memories.

Knowledge in various areas usually grows, based on previous knowledge. This is true for ideas in our heads, as spurious memories are based on real memories, and in communities as fields of knowledge

expand.

In most cases things are so complicated that we basically do things, or come up with solutions as we go along. This is how laws are usually made. Something is found to be statistically correlated with something and it is usually banned. An example of this is the link between road accidents and drink driving. This is of course a danger to doing this unabated, and it generally results in more and more laws, and a more and more complicated society in which we have to live in.

The growth in overall human knowledge is made by the constant exchange and sharing of information. Although the human mind is naturally equipped with the ability to generate new ideas, it would not generate many if it was not constantly bombarded by lots of other ideas from other people. This is what makes progress possible. No man is an island, and if he was then he would generate very few ideas, indeed most people, even with the constant barrage of ideas from others generate very few ideas themselves.

I was under the impression that some things like learning specific dances are so memetic because they involve such detailed and specific moves, but once one learns the basics of a particular dance, such as the 1, 2, 3, pause, 5, 6, 7 rhythm of the salsa, one can then generate other moves based on this. This is where creativity, and spurious memories come into the picture, even in what appears to be a copying process, and from what we have said earlier one needs to know the basics of something before they can generate new ideas. This is because spurious memories are generated by combining knowledge together in new ways. You cannot be creative without knowledge and new ideas do not mean anything unless you know enough to appreciate them.

The interesting thing about dancing is that there are various forms of dancing, a radiation effect that is often observed in biological species. The reason for this is that the brain generates a fanning effect as new creative states are built upon previous knowledge. In the case of dancing we have slow dances like the waltz, rock and roll, salsa, and even disc dance music. Although for example disco dance music may not appeal to many people if they just sit and listen to it, it has evolved for the purpose of that type of dancing.

### creativity in animals

### what was the real bottleneck in memetic evolution and what actually cause the human brain to explode in size?

As we will argue later in chapter 3, spurious memories are an obvious candidate for creativity and are expected to be present in most animals nervous systems, as they are a natural consequence of the storage of memories in common areas, sharing neurons and synapses. Spurious memories are also required to learn something new. Without them all we would be doing is recalling whatever is stored in the brain.

Liane Gabora suggest that creativity may have been the bottleneck in the rapid expansion of the brain (Gabora, "To Imitate is Human: A Review of the meme machine by Susan Blackmore", Dynamical Psychology 1999, <http://www.goertzel.org/dynapsyc/1999/meme.html>). We do not believe that this is true, but in any case it does suggest that we are more than mere copying machines, or 'meme machines' in the words of Blackmore. If there was no creativity generated in



the human brain, and all that we did was copy each other, then one would need to explain where our new ideas come from in the first place. Either there were only a handful of creative people, from whom most of us copied, or creativity is something which is naturally inherent in all human brains, or perhaps it resides in the actual interactive processes between humans themselves. See the discussion below. It could have been that this sudden ability to generate new ideas started the whole process off. Once again, even in this scenario, it would appear that the evolution of memes is what also drives this system after it is established. What we are saying however is that the generation of creativity may have been the hurdle that we had to overcome to enable the system of useful information transfer to start its evolutionary journey. Without any new ideas in the first place there was nothing that had to be copied from each other. Once we realised that there was a survival edge to some of the new ideas floating around we copied them, but this ability to copy was something that we already had, and did not require a massive sized brain.

Since most animals have neural systems and given the fact that spurious memories are a natural consequence of such systems, we feel that creativity exist in all animals. They require this to be adaptive in an ever changing environment. Also some mammals have a very similar brain stucture to our own, with many of the same brain organs, like a cortex, a hippocampus, a thalamus and a brainstem. Incidentally, one could also argue that the emergence of a nervous system slowed down evolution, as animals were then able to adjust to changes in the environment without need for biological evolution. It then follows that our large brain size and our extraordinary mental abilities were not cause by the existence of spurious memories per se, although as we have argued, creative ideas are required to drive the evolution of memes. But what is require to make this work is the ability to copy, which animals are generally not very good at. Although some intelligent animals do seem to copy each other, what they copy is generally quite trivial, and it take a long time for good ideas to diffuse through a group of animals. If animals were good at copying each other they would have more extensive cultures. If animals were able to develop their skills of copying each other then they would also develop like us. It then stand to reason that imitation may have been the reason why we have large brains with different mental capabilities. It is nevertheless also true that the evolution of memes requires creativity, and that this is a integral part of the evolution of memes.

Another way that creativity may arise is somehow in the actual exchange of information. In other words creativity is a group thing, or a property of a society. May be a certain critical mass in the exchange of ideas needs to take place before creativity is generated, just like a fire needs sufficient heat to start to burn. Creative ideas may also arise through mistakes, either in someone's head or in the transmission in information. But in order to make mistakes in neural systems, which are generally robust to noise, and mistakes in transmission one need to have the capacity to generate and to learn new states, and we have argued elsewhere that the only way that this can happen is through spurious memories again.

Yet another possibility is that even though other animals may have creativity, we are exceptionally more creative than them. I am not sure I believe this because I think that we are probably able to utilize our creative ideas more readily than other animals, because we have more knowledge with which to work with. The human race also encourages creativity, and I would suggest that this is because creativity helps memes to vary. In this sense creativity may have been spurred on and developed by memes. If this is true, then it is possible that creativity did drive the rapid expansion of the human brain. Blackmore suggests that the expansion of the brain occurred when humans started to mate with those who had the ability to imitate because it was considered or realized to be important for survival purposes. She also assumes that the ability to imitation represents a profound leap in cognition and requires a large brain. Another possibility is that we may have developed the ability to imitate because it clearly has a biological advantage, but it was the ability to be creative

that caused the rapid expansion in brain size, and it was the preferred mating with individuals who were creative, who were so capable of solving challenging problems. In this case what makes us different is not just our ability to imitate but our uncanny ability to be creative, imaginative, thinking and planning individuals.

Blackmore suggests that we are slaves to memes, and that most of what we do is controlled by memes themselves. In a slightly less extreme point of view (assuming there really is a self) one can argue that we decide which memes are propagated. But as noted before, if the self is an illusion, which is the position we favor, then this belief is itself also an illusion as all we are just acting according to our memes. The human brain is nonetheless special in that it has the capacity to be creative and memes thrive on new ideas. Memes thrive on good ideas. It doesn't matter whether we generate such ideas consciously or self-consciously. In this sense we are more than the blind 'meme machine' suggested to by Blackmore, that just copies memes from person to person. We generate new ideas for memetic evolution. Blackmore's position on this is that memes generated creativity in our brain, but as we have argued quite extensively creativity is a natural consequence of how memories are stored in the brain, utilizing what are termed spurious memories. In this sense memes are also slaves to our creative ideas. Without our creativity memes would not have anything new to transmit.

### Individualism versus Bureaucracy

In our view there are basically two different types of people: people who copy others, who abide by ever rule, puppets, people who go along with everything and never question anything and are happy to go along with the status quo; and people who are creative and question almost everything around them. There are of course people in between these two extremes, and many of us may go from one extreme to the other, trying to find a balance in between. The problem with being too rebellious is that you are often labeled a trouble-maker, and the problem with being too bureaucratic is that you become too lifeless and uninteresting, and although high levels of individuality are shunned upon, people with no individuality are labeled as boring and do not have many friends, and without any friends you have no one to exchange memes with. people with too much individuality are also generally ignored and isolated, unless they come up with some extraordinary discovery. This is one of the reasons why many people strive to make some important discovery that may make them household names. When this is achieved they generally go from being ignored to being worshipped. the road to stardom is often very difficult and many people never make it. Some author may write a few books and never get published or recognized for what they really are. The same applies to musicians, politicians and scientists.

Usually it is easiest to go along with everyone else and most people do indeed choose this path.

Some employers own their own business and one can appreciate why they might be tough on the workers, so they can make more money, but in some cases an employer or superior just wants to make life a misery for his/her workers to have control over them and their memes. A classic

example of this situation is seen at universities, an institute where the university actually belongs to no-one in particular and to everyone, yet heads of departments and deans, who are themselves academics go around bossing people around, often for no particular reason. The situation at universities is especially intriguing as academic administrators make up their own rules as they go along, occasionally kept in check by unions. Some administrators, particularly at universities, are shallow insecure people who try to stifle creativity in their colleagues because they do not possess these attributes. They have often resigned to the fact that they will not be making any further or major contribution to science or humanity, so will not become famous (a meme goal) and so they chose instead to impose themselves by gaining control over others. They think it is better to be a big fish in a little pond than a small fish in the ocean. That is why many academics become administrators. At least this way they can impose their memes onto others. If you have had any experience with universities you will know what I mean. You are constantly confronted with filling in forms and changes to your workplace for the sake of imposing things upon you to keep you busy with their worthless memes. This way these less creative people also stifle your ability to be creative so that they do not look that bad themselves. I pity administrators.

Many people want to be individual. The reason for this is that they want to stand out from the rest of the crowd. This way they may appear to be interesting and others may want to listen to them. A balance is however required, because at the same time one needs to be part of the human race, or they will be in isolation. There is a memetic explanation for this. Memes evolve slowly and new ideas have to fit in with previous knowledge; we cannot afford to be too brave or too bland. This is interesting because our individuality usually uses concepts and ideas based on others, ideas that we perceive that may take off and become popular. Some people will stand out by wearing their hair in some way, but their choice of style is usually based on something someone else has already trialled or partly developed.



## Chapter 4: The Conscious Brain

Crudely speaking, consciousness relates to our awareness of what is going on around us, or the sensation of experiencing what is happening. We are all aware of this feeling but it is difficult to quantify exactly what it is, and hence to define it and understand it. It is nevertheless widely recognized that consciousness plays a major role in the storage of memory, or in what we learn. Most brain states seem to need to enter consciousness before they are learnt.

It is thought that some animals, particularly mammals, may have some form of consciousness, but the human brain seems to be acutely conscious and we are also aware that we are aware. This reflective form of consciousness, or self-awareness, gives each of us a sense of 'self', and is intimately linked with our extraordinary abilities to direct our attention, to plan our lives, to imagine, to think, to learn what we want to learn, to act with 'free will', and to interact socially with other human beings. Self-consciousness is at the core of our state of mind, our mental well-being, and our personality, and influences our perception of everything we experience.

### 4.1 Can we hope to understand consciousness?

When Aristotle observed headless chickens running around, he decided that the mind was in the heart. We now take it for granted that the mind, or what is sometimes referred to as the soul or consciousness, resides in the brain. Some anecdotal evidence for this comes from the fact that our state of consciousness is altered (or lost) when we are asleep or dreaming, anesthetized, in a coma, influenced by drugs (which affect the brain), or if we are concussed by a severe blow to the head. During surgery it has been reported that conscious experiences of past memories are induced by electrical stimulation of the temporal lobes, which are located on the sides of the brain (Penfield 1975). Most scientists would not dispute the fact that consciousness is in the brain. The question is, how does the brain manifest consciousness (and self-consciousness) out of a collection of 'dumb' neurons, whose only function seems to be to either fire, if they receive sufficient stimulation from other neurons, or to remain quiescent.

From a reductionist's point of view, the brain is just a physical machine, or more appropriately, as we saw in Chapters 2 and 3, a bio-electrochemical machine. We should then be able to understand what consciousness is, if we understand how the various parts of the brain work, and interact with each other. This however may not necessarily be the case. 'Chaos theory' has shown that the whole may be bigger than the sum of the parts. By the same token, chaos theory has also demonstrated that simple component systems can lead to complicated and rich collective dynamics, so there is hope that something rich and complex can emerge from simple components. Emergent behaviour is a general property of many-particle systems. As we saw in Chapter 3, this is how the brain generates 'content addressable memory', or its ability

to recall a memory from an imprecise input. Many-particle systems are capable of self-organization. They can achieve things together without the need of a supervisor to orchestrate the components. In a sense, this is what the brain does.

Consciousness, intelligence, perception, emotions and pain are all sensations that are generated by a large collection of self-organizing neurons. One of the main stumbling blocks in understanding consciousness is that it is thought there must be some special place in the brain where information is assessed, contemplated, and then acted upon. Consciousness may instead be located in the self-organised emergent behaviour of neurons, nowhere in particular, and involving most of the brain.

There are scores of wonderful natural patterns, observed in Nature, which are the result of such many-particle systems interacting with each other. The shapes of clouds are a nice example of this. Somehow, water molecules are able to arrange themselves through local interactions to form amazing global patterns, sometimes stretching across the entire sky. These patterns or structures are quite typical of chaos theory. They usually have the property that an examination of their underlying structure reveals a similarity to their global structure, just like the branches of a pine tree resemble the tree itself. These objects are referred to as 'fractals' as they seem to have a certain fuzziness about them that gives them a fractional dimension. Chaotic effects can also occur when there are a small number of particles.

Chaos, as it has come to be known, is a general property of systems that are termed 'non-linear'. Non-linear systems, are systems where there is no direct or proportional correspondence between action and reaction, or cause and effect. Most systems in Nature are of this type. [Neurons are non-linear devices and a collection of them can be construed as a non-linear system.] Non-linear systems are extremely difficult to solve, if not impossible, and lead to very complicated dynamics and phenomena. This means that even if we know the precise underlying equations, or the full micro-dynamics of a system, this does not mean we will necessarily be able to understand the long-term or the global behaviour of such a system. What happens is that errors (or what can also be construed as lack of knowledge) grow exponentially fast (which means very quickly) as the system evolves in time, and it does not take long before we have lost all knowledge about the state of the system. In dynamical systems (or systems that change with time), the system nonetheless seems to confine itself to fractal looking objects, called 'strange attractors', where the system almost goes around a cycle and comes back to itself.

Chaos theory places fundamental limitations on our ability to solve large natural systems beyond a certain inherent accuracy. One of the best known examples of a chaotic system is the weather. No matter how accurately and how closely we measure the temperature, pressure and humidity around the Earth, and in spite of our full understanding of the underlying physics, we can generally not predict the weather beyond 10 days or so, even with the aid of the world's most powerful computers. 'Chaos theory' was first discovered by the eminent mathematician Henri Poincare,

who pointed out that chaos can arise with only three interacting particles. Poincare entered a contest sponsored by the King of Sweden, who wanted someone to prove that the solar system (or Isaac Newton's equations) was stable. Poincare was unable to show this but won the prize anyhow for his profound contribution to the three-body problem (Peterson 1993). The zoologist and physicist Bob May has pointed out that if the Moon's orbit around the Earth was not in the same plane as the Earth's orbit around the Sun, the lengths of our days and years may not be uniform, but may vary in a chaotic manner (May 1990). If the three-body problem is intractable, what hope do we have of understanding the complexity that is possible when hundreds of billions of strongly interacting neurons are involved? Not only do we have many non-linear devices, with their own internal dynamics, but a very large number of them. Many scientists argue that the brain is the most complicated self-organising system imaginable.

Some philosophers and scientists, like the prominent mathematical physicist Roger Penrose, believe that we may never be able to explain consciousness, due to fundamental limitations based on Godel's theorem or 'quantum mechanics', or simply that it may be impossible for the mind to truly understand itself (Penrose 1989). Godel's theorem is a mathematical theorem which essentially states that one can pose certain mathematical questions which cannot be answered within a given set of axioms or assumed rules (Hofstadter 1979). 'Quantum mechanics' is the 'weird' theory of atomic interactions, which works extremely well, but is not very well understood by physicists. Quantum mechanics combines the observer with the experiment, and places fundamental limitations on how accurately one can measure simultaneous properties of atomic particles (the so-called 'Heisenberg uncertainty principle'). On the other hand, sufficient limitations on our understanding the brain may come from 'chaos theory' itself.

One of the main difficulties with a scientific understanding of consciousness is that it is very difficult to define consciousness precisely and objectively, other than to say that it is the feeling of awareness, or of knowing what is going on, that we all experience. The heart of the problem is that we are trying to devise an objective understanding of 'subjectivity' itself. As a consequence there is little scientific data on consciousness, and much of what is written about consciousness is based on subjective introspective experiences of either the writer, or of the experimental subjects. These views, which come under the guise of philosophy and psychology, have practically reached their limitations in what they can tell us about consciousness. Their shortcoming is that they are studying 'subjectivity' subjectively, and they often treat the brain as a black box. 'Qualia', for example, which refers to the question of whether we actually see the same 'redness' of red, may be so personal that we may not be able to communicate it to others. The true road to understanding consciousness now lies with neuroscience and understanding more precisely how the various components of the brain generate this fascinating attribute of brain function. Neuroscience may be able to resolve that 'red qualia' corresponds to a certain pattern of firing neurons, which are basically the same for everyone. A particularly

interesting approach to consciousness studies is where psychology and neuroscience are combined together, and one monitors the brains of human or animal subjects while they are performing certain tasks.

For several decades consciousness was regarded as a taboo subject. Neuroscience is currently re-engaged in the search for the underlying neural mechanism that is the basis of consciousness (Crick 1994; Crick and Koch 1992; Hobson 1998; Horgan 1994). The subject of awareness is often placed at the heart of our very existence and has consequently fascinated scientists and philosophers for centuries and millennia respectively, and probably will do so for centuries to come. There is no reason why we should suddenly unravel the deep mystery of consciousness overnight. The hope is that something more concrete may develop in the next ten to twenty years, particularly with the aid of sophisticated techniques to probe the brain, such as PET (positron emission tomography) scans, nuclear magnetic resonance imaging, and by inserting electrical and chemical probes (and probably also by injecting electrical and chemical currents) directly into the brain. The hope is that, if we can capture enough details about what the brain is actually doing, when we perceive to become conscious of certain aspects of our memory or awareness, we will be better placed to understand consciousness. The general consensus in the neuroscience community is one of subdued optimism.

In what follows, we will adopt a more pragmatic point of view, and try to detail what is known about consciousness, and how we believe these features of consciousness can manifest themselves from the electrical, chemical, and biological properties of the brain. One of our goals will be to try to qualitatively incorporate these recognisable features of consciousness in terms of our attractor neural network models, discussed in Chapter 3.

#### **4.2 Attractors and consciousness**

It is reasonable to initially model the brain by using only the most prominent features of neurophysiology and neurobiology. More complicated models can be developed later by including more realistic biological features as the need arises. We prefer this bottom-up or semi-reductionist approach. In this case one uses only the essential features of neurons and studies the emergent properties of networks connecting these simple neurons, followed by the interaction of interconnected networks of neural networks. Our starting point will be the attractors, or attractor neural networks, which were extensively discussed in Chapter 3.

Attractors are fixed-point states in the neural dynamics, when networks of neurons collectively stabilise their activity and the network reverberates, or reiterates, in the same state of excitation. An attractor could be either a stable pattern of active neurons, or a set of rapidly firing neurons, or a set of neurons firing in phase or synchronously (that is, at the same time), or a set of neurons firing at the same frequency, or a combination of such effects. Attractors are a good candidate to



represent a significant cognitive event, such as the retrieval (and subsequent recognition) of a memory, or the initiation of an idea or a decision. If an input is unimportant or unfamiliar (or if a decision cannot be made), an attractor is not attained, and the configuration state of the network/brain wanders endlessly without ever reaching an attractor. In this case, the input is not recognised because the network did not converge to an attractor. If the input is familiar, an attractor is attained. As an example, we arrive at an attractor if we see someone whom we know, but there is generally no response to a stranger. Sometimes we may not recognise someone immediately in which case it takes a little longer to arrive at an attractor. This is probably because the attractor corresponding to this person was either not strongly encoded in memory, or the input was too different from the stored memory.

In this model, a memory is represented by a certain stabilized pattern of neural activity, scattered across the brain, much like a picture made out of black and white pixels, where the white pixels correspond to the active (or repeatedly firing neurons) and the black pixels to the quiescent neurons. Some localised clusters of these active neurons may represent certain features about the memory, such the colour or shape of an object, it's name, or an emotion associated with it. In general, a memory is stored distributively across a number of different areas in the brain and distributively within each of these sub-areas. A memory is recalled (or recognised) if the neural dynamics converges to the attractor associated with that memory.

Our discussion below is based on the premise that attractors are a useful paradigm in understanding memory and ultimately other higher-level brain functions, like consciousness. This view is not unreasonable, since it is difficult to see how chaotic 'strange attractors' or 'limit cycles', which are the other two possible end products of a dynamical system, can provide a basis for a significant cognitive event. The problem with 'strange attractors' and 'limit cycles' is that they are unstable and sensitive to noise, whereas attractors thrive in noisy conditions and allow for the retrieval of memory from noisy or imprecise input. This is the basis of 'content addressable memory', and the brain seems to function in this way. Noise is also a general trait of Nature. See Chapter 3 for further discussion on this.

Note, although memories are attractors they can nevertheless correspond to complex fractal patterns of firing neurons. This has something to do with the way that memories 'interact' with each other when they are being stored, and not with the dynamics of the memory recall process. Chaotic signals, which generally look quite erratic (but not completely random), have been observed, for example, in electroencephalogram (EEG) recordings of electrical signals measured on the scalp or surface of the brain. Some researchers have suggested that chaotic attractors may play a more significant role in memory recall and decision making processes (Freeman 1991, Yao and Freeman 1990), but we believe that the brain principally operates in a non-chaotic regime, and that chaos in the brain may be more useful as a means to understand brain disorders and cognitive malfunction.

Consciousness is mainly associated with sensory perception (seeing, hearing, smelling, touching, tasting, and feeling pain), and with higher-level functions like thinking (also called cognition), planning, voluntary movement, language, and some emotions (like pleasure and love). All of the sensory information that the brain receives is initially processed in some specific primary area in the cerebral cortex, such as the primary visual cortex in the occipital lobe, the primary auditory cortex, and the primary somatosensory cortex. In these primary areas, the input is massaged to extract certain features about the data. In the case of visual information, this would include such things as line orientation, shape, perspective, and movement. [Note that some processing of visual information (such as spot size, contrast and colours) takes place in the cells located in the retina, before it is relayed to the primary visual cortex.] Information gleaned from the primary cortex is then processed again in higher-level cortices, to extract more complex features, and is also relayed to other associative memory cortices (where it can be ‘compared’ to previous memories), or combined with other processed information from some of the other sensory channels.

In the associative memory networks, the processed information is compared with (or more precisely, processed according to) previous experience or memory. If this process leads to an attractor this signifies that the input was either familiar or significant. Our basic premise is that consciousness is concerned with the ‘realization’ that attractors have been attained in some of these associative memory networks in the brain. Most of the initial processing, such as the extraction of features about the input data, is largely an unconscious process. Our assertion is that consciousness is intimately concerned with the recall of ‘end of the line’ associative memory. We should clarify this with the statement that associative memory is not the only thing that we can become conscious of. We can be conscious of bodily sensation, such as pain, pressure, temperature, movements, or even our heartbeat. These sensations and motor control/actions may also involve attractors.

If we are conscious of our own attractors or memories this would explain why our conscious experiences are so personal, and involve much more than the simple awareness of information coming in through our senses. There is a considerable amount of interpretation made on the basis of information already stored in the brain. We largely experience the world according to our own memory store. As we saw in Chapter 3, input into the brain is actually processed by previous experience and memory, which is stored in the synaptic connections where neurons communicate with each other. This is quite peculiar since, in a sense, the brain’s hardware is also its software. Someone may perceive an event, such as skydiving or car racing, as being dangerous, while someone else may perceive exactly the same event as being quite exciting. Clearly, our memory store influences our conscious experiences and our perception of the world. Also, if something is unimportant to us, we generally do not notice it. In the language of attractors, insignificant input does not lead to an attractor and hence does not reach consciousness. But how can the brain make such realizations? How can it observe it’s own attractors?

The chemistry of the brain, which fluctuates during the course of the day (and during the night), plays a prominent role in our conscious perception. At times we may be angry or upset about a certain matter, while at other times we may not even be perturbed by the same situation or circumstances. Our moods are controlled by certain neurochemicals, whose absence or presence (or proportion of) may lead to an entirely different attractor or memory state, and whether or not we learn from what we have just experienced. As noted in Chapter 3, when the brain is operating under a different brain chemistry, whether this is internally induced (such as in sleep) or by the influence of drugs, the brain may recall and store different attractors for the same input state. This is because neurotransmitters control the amount of neural charge that traverses the synaptic gap, and this is precisely where memories are actually stored in the brain. A slight increase in a certain neurotransmitter can easily change the dynamics so that a different attractor is obtained.

Another important point that needs to be clarified, is the way we often say that an 'input' is compared to our memory store, whereas this is actually not what happens. The word 'compare' gives the connotation that a comparison of an input (or its derived attractor) is being compared at a higher-level, whereas what is actually happening is that the previous memory is used to process the input. If the input has sufficient correlations to some of the stored memories, then an attractor is attained, but if not, the network wanders around without reaching an attractor. There is no comparison as such, taking place. The ill-founded notion that input is compared to stored memory, may contribute to our misunderstanding of consciousness. It implies that a comparison or observation is taking place, that someone or something must be observing the activity of the brain, whereas what is probably happening is largely an unsupervised process. The way memories are stored in the brain is also imperfect, very different to how memory is stored on a computer, where every bit of stored information has a precise (binary) address and is recalled perfectly. Memories in the brain are subject to continual change as other memories are stored in the same general area.

In subsequent Sections we will consider other interesting features about consciousness, such as the fact that it is serial or sequential (for example, we can only think of one thing at any one moment), and we will try to incorporate these features into our attractor neural network framework. As in Chapter 3, we will focus our attention on static memory. One should recognise, however, that the brain is also capable of storing 'dynamic memory' or 'temporal memory', so our discussion about consciousness eventually needs to be extended to handle these types of memories. Dynamic memories are memories with moving pictures or sounds, memories that flow, such as something that someone may have said or done, or a scene from a movie. In its simplest form, a dynamic memory can be made up from a sequence of static memories or attractors. Such a sequence of static attractors or memories could be represented in the mind as a moving picture. This scenario however seems to be inadequate to account for the speed of neural processing that takes place when, for example, we are playing music, or taking part in a conversation with someone. This

situation may call for other forms of memory dynamics in addition to attractors, as was briefly discussed in Chapter 3.

The other thing about some of these dynamic memories, such as playing a guitar or the piano, is that when we first learn them we have to think about what we are doing, such as where to put our fingers and which strings to pluck or keys to hit, but after awhile, when we become really good at them, we do not think about what we are doing very much at all. These sorts of memories are sometimes referred to as 'muscle memory' or 'implicit memory'. It is as if the absence of direct thinking has helped to speed up the processing. This could mean that after a sequence of attractors has been learnt so well, they are converted into a different more direct feed-forward arrangement without reference to the intermediate attractors. If consciousness corresponds to the identification or the realization of attractors, then this would also explain the lack of consciousness that follows well-practiced skills.

### **4.3 The binding problem**

As we shall see below, consciousness is largely a serial process, and therefore the attentional aspect of consciousness needs to be shared between the various attractors that arise in the brain. In the neural dynamics there may be many attractors arising in various parts of the brain simultaneously. Some of these local attractors (or features) will be bound together to form a larger single memory, whereas other local attractors will be bound together to form other complete memories. These various attractors (local and global) are in constant competition with each other, competing for attention and the right to enter consciousness, or to be 'seen' by the brain.

The question of how various aspects of a memory are bound together, to form a complete memory, is called the 'binding problem', and is often referred to in the consciousness industry as the first hard problem of consciousness. A red rose for example, contains a visual image of a rose (stored in the visual cortex), a smell of a rose (stored in the paleocortex), a texture or thorniness component (stored in the somatosensory cortex), a pleasure component (stored in the association cortex and the amygdala) and a verbal or descriptive component (stored in the language centers of the brain). Somehow these attributes of the memory of a red rose are combined together to give us the complete memory, which is a single-minded representation of a nice perfumed red thorny rose.

This binding may take place as these networks (or neurons) reverberate together. Other researchers have suggested that as binding takes place these networks synchronise their neural firing activity at around 40 cycles per second (Crick and Koch 1990; Eckhorn et al 1988; Gray and Singer 1989). These 40 cycles per second oscillations were originally observed by placing microscopic electrical recorders into the brains of alert cats. It is not clear however, if these synchronised oscillations in the brain are a basis for binding, or if they are just a consequence of the binding.

Synchronisation in coupled systems is a general physical phenomenon first observed by Dutch physicist Christiaan Huygens in the 17<sup>th</sup> century. Huygens noticed that two clocks hanging on opposite walls in a room, which were initially swinging out of synch, would eventually start to tick in perfect synchronicity (Per Bak, Bohr and Jensen 1985). This ‘phase locking’ came about because the two clocks were actually able to communicate to each other (or were coupled) by minute vibrations that travel through the walls. Many other physical systems display this sort of phenomenon, as well as ‘frequency locking’, where parts of a system oscillate at the same rate, or in multiples of each other. The moons of Jupiter rotate around the giant red planet (moon years) in integral multiples of the rotation period of Jupiter (Jupiter days). Our own moon never reveals one side of itself (the so called dark side of the moon) to us for the same reasons. Here one moon day equals one moon year.

In an effort to address the binding problem, Francis Crick and Christoff Koch have focused their attention on the visual system of the brain because this is the best understood and most mapped neural pathway in the brain (Crick and Koch 1990, 1992, Crick 1994). The hope is to observe some neural correlate of consciousness, such as the 40 Hertz (cycles per second) oscillations, as the subject (generally a monkey or a cat) becomes aware of a phenomenon called ‘binocular rivalry’, where the subject suddenly sees a disruption to their visual field.

The problem with these synchronised oscillation theories is that they do not really solve the binding problem per se, because proper binding would require these synchronously oscillating neurons to be somehow actually observed together by some other body, brain organ, or so called ‘awareness neurons’. If synchronisation is associated with consciousness it may help to pinpoint the ‘awareness neurons’. Alternatively synchronicity may have other uses in the brain, such as coordinating the movement of our limbs. Note that reverberating attractors provide the same amount of binding as synchronous oscillations do.

Another (genuine) attempt at solving the binding problem has been made by Roger Penrose. Penrose proposes that binding may take place through some sort of quantum coherence effect between the proteins and the ‘free’ electrons occurring in the microtubules, which are long thin tubes in the nervous system that are generally used to transport chemicals to neurons (Penrose 1994). The quantum synchronicity between activated neurons may be able to explain the binding problem, but seems to paradoxically call for quantum (atomic) physics effects on the scale of the brain. This is quite unusual, given that quantum effects are generally restricted to the atomic scale. In this theory, consciousness (for those with a physics background) comes about as the global ‘wavefunction’, representing these electron or protein states, collapses into a coherent state.

#### 4.4 The thalamus and special awareness neurons

Attractors can be detected and subsequently bound together in the brain if there is some special brain structure, which monitors and detects attractors in the associative

memory networks. The thalamus, which is anatomically and functionally centrally located in the brain, is an interesting candidate, since all sensory input (other than smell) passes directly through it before it is relayed to the cerebral cortex (Crick 1984; Kandal, Schwarz and Jessell 1991). There is a small nucleus of neurons in the thalamus for each type of sensory input that projects exclusively to its corresponding area in the cerebral cortex where it is processed. Visual information for example passes through the ‘lateral geniculate nucleus’ in the thalamus, auditory information passes through the ‘medial geniculate nucleus’, and somatic information (relating to touch, movement, pain and temperature) passes through the ‘ventral posterior lateral nucleus’. With regard to smell, our most primitive of senses, the thalamus is still indirectly involved. Since smell may have been the first sense developed by animals, it seems to be processed differently from the other senses. Smell is initially processed in the olfactory bulb, and then in the paleocortex, or ‘old cortex’. [Incidentally, this is the reason why the cerebral cortex in humans is sometimes referred to as the neocortex, or ‘new cortex’.] Although information about smell does not initially enter through the thalamus, once it is processed in the paleocortex, it is relayed to the orbitofrontal cortex, in the cerebral cortex, via the ‘medial dorsal nucleus’ in the thalamus.

Each of the associative memory networks in the cerebral cortex also has massive connections back to its corresponding nucleus in the thalamus, forming what are called the thalamocortical loops. The reason for these back connections is not understood, but it appears that each of the nuclei in the thalamus, for some reason, needs to know what its corresponding cortical area is doing. The central role of the thalamus as the gateway for all sensory input entering the neocortex and its widespread two-way connections to most areas in the neocortex, has lead researchers to suggest that the thalamus may be involved with consciousness and in particular with the attentional aspects of consciousness (Crick 1984, 1994; Penfield 1975).

Thalamocortical loops are also interesting because when we are asleep, particularly a deep dreamless sleep, or so called slow-wave sleep, there are large thalamocortical oscillations which resonate and this overrides the brain’s ability to process incoming sensory information from the external environment or internal signals from the brain-stem. (See Chapter 6 on ‘The Dreaming Brain’ for more discussion regarding internal neural stimulation during sleep.) This is particularly interesting because during this ‘deep sleep’ we experience almost complete loss of consciousness, which Hobson likens to the coma state (Hobson 1998).

One of the problems with suggesting that the thalamus may sample the associative memory networks for attractors, is that the thalamus appears to be is much smaller than the associative memory networks in the neocortex, but it could incorporate more specialized neurons or properties of neural networks to detect attractors. It is unclear however, what proportion of the neocortex is actually required to store memory. Most of the neocortex may be used to process information. (See Section 3.8 for a discussion on the capacity of the brain and the amount of information that may be

stored in it in a lifetime.) If the associative memory networks oscillate synchronously for example, this synchronicity can be detected by special neurons in the thalamus, which detect the time of arrival of signals. Theoretically such neurons, if they exist, could determine which of the input neurons are simultaneously active, and which are not, and in this way they could also monitor networks of neurons. Theoretically a special awareness neuron would need to exist for each neural subnetwork state (or attractor). To allow binding to occur between different subnetwork attractors, these neurons would also need to be able to communicate with each other in the thalamus. This is what makes the thalamus particularly interesting. At the next level of consciousness, or self-consciousness, one might have to postulate yet another 'observer' to monitor these special neurons.

The other problem with 'central detection' is that the actual 'feeling' of awareness seems to be intimately linked with the experience itself. This suggests that the detection is somehow relayed back to the reverberating associative memory networks, and that consciousness at least partly resides in these neural networks. This lends itself to the possibility that neurons and neural networks actually monitor themselves, through feedback mechanisms, without the need for a central observer. See the next Section.

As we saw in Chapter 3, the hippocampus plays a prominent role in the storage of episodic conscious memories and it too may be implicated in some way with the observational aspects of consciousness. In some ways the hippocampus acts like an addressing system for memories stored in the neocortex.

An interesting brain structure worthy of mention, but probably not directly associated with the observational aspects of consciousness, is the locus coeruleus (LC), which is located in the brain-stem. Although this small nucleus only contains about 3000 neurons it has broad efferent connections to about one third to one half of all cells in the brain, particularly in the forebrain. The LC is thought to distribute norepinephrine to most of the neocortex when something is to be learnt (Hobson 1989; Aston-Jones and Bloom 1981a). During rapid-eye-movement (REM) sleep, the phase of sleep associated with dreaming, the LC essentially stops firing (Hobson 1989; Aston-Jones and Bloom 1981b). This is interesting since during REM sleep we essentially lose consciousness (some people do not dream or recall that they dream) or experience a state of transient consciousness, which could really be just a state of consciousness without learning. This suggests an intriguing link between the locus coeruleus, consciousness and learning. Another interesting fact about the LC is that when it was electrically stimulated in rats it led to a state of heightened awareness, or hypersensitivity to sensory visual, auditory or tactile input (Snyder 1986). The LC also seems to be the indirect target of the drug LSD (lysergic acid diethylamide) which leads to a state of profound self-consciousness (Snyder 1986). LSD decreases the activity of serotonin neurons in the 'raphe nuclei', but for some reason this increases the sensitivity of the norepinephrine neurons in the LC.

#### 4.5 Bootstrapping and computers

One way consciousness could arise is if some neural networks were actually observing what the other neural networks were doing. In order to explain self-consciousness this realisation needs to be observable, which means the observing networks also need to be observed, requiring yet another hierarchical observational structure. Then we are also aware that we are self-aware. A possible way out of this dilemma is if there is some sort of bootstrapping mechanism whereby the various networks are simultaneously observing each other. As the brain is highly interconnected and recurrent (meaning that many connections in the brain come back onto themselves), such a prospect is imminently possible. Another intriguing aspect of the organization of the brain is that it comes in two almost identical halves, a left hemisphere and a right hemisphere. A natural thought may be to suggest that these two halves are watching each other, however people who have had their corpus callosum (or the massive white fibres connecting the two hemispheres) cut, so called 'split-brain patients', still seem to have consciousness.

It is often asked if computers can ever have consciousness or real intelligence. What is distinctive about computers is that they execute instructions serially, one by one. In our view such computers can never have consciousness. We believe that parallel processing and recurrent connections are essential for the purposes of monitoring, realization, consciousness and reflection. Massively parallel computers may be an entirely different story, although one should remember that there are many animals which have millions of highly interconnected neurons, such as insects, which are probably not conscious.

On the question of intelligence we would have to give computers the thumbs down as well. There are a number of aspects relating to intelligence, such as a conscious awareness (which incorporates our ability to extract from memory, to perceive, and to plan), creativity (the ability to come up with something completely new), adaptivity (the ability to handle a novel situation), the ability to recognise complex patterns, and the ability to imitate from imprecise instructions. In our view, all of these capabilities seem to require the ability to make and accept small errors, and to view aspects from a global perspective, which are hallmarks of parallel distributed processing and emergent behaviour. In the next Chapter we will argue another important difference between a computer and the brain (which gives the brain some of these abilities) is that in the brain memories are stored in an overlapping fashion. This gives the brain the capacity to be creative and adaptive, or to generate new brain-states that were not stored in it intentionally.

It is interesting to note that the brain seems to have two basic types of neural networks: either highly interconnected recurrent networks, or what are called feed-forward networks. In feed-forward networks, information is processed by one layer of neurons before it is transmitted to the next layer, and so on and so forth, while in



recurrent neural networks information is consistently fed back into the initial neurons or layers of neurons. Our basic premise is that consciousness occurs in recurrent neural networks, and that it is not possible in feed-forward networks. It is interesting to note that some areas of the brain are highly recurrent, such as in the hippocampus and in some areas of the neocortex. These areas are known to be important for memory storage. The neocortex also seems to have many feed-forward type networks. Much of the cortex is heavily columnised and each column is divided into layers. In some columns there is significant interlayer feedback while in other columns processing seems to be more of a feed-forward unidirectional nature. There are also many inter-columnar connections, which could make a group of columns highly recurrent. If our notion that consciousness requires recurrency is correct, then one would expect that the areas of the brain which are involved with automated functions, such as extracting features from our sensory input, would be more feed-forward, and areas which are more involved with comparing this processed information with previous memory stores, the sort of things that we are likely to become conscious of, are highly recurrent. This notion could be tested experimentally.

On the question of computers again, one may ask whether a network of computers can have consciousness. Imagine that we were able to connect one million or so computers, on the Internet perhaps, which could interact with each other, just like neurons do. Would one expect this network of computers to develop consciousness, just as a bunch of neurons do? What would this mean? Where would this consciousness reside? Would it be necessary to observe what all of the computers were doing to have consciousness? In such a case, who would be doing the observing? These are the same questions that are asked about the brain in relation to consciousness. This example with a network of computers clarifies the dilemma we are confronted with in understanding what consciousness is in the brain. In addition to consciousness, the human brain also has self-consciousness, which in terms of the computer network system, means that not only are the active computers observed, but the observer is also being observed.

#### 4.6 The serial nature of consciousness

A particularly interesting feature about consciousness is that it seems to involve a largely serial or sequential process, even though the brain mainly works in extreme parallel. Although we are able to process different bits of information simultaneously, for example we can hear, think, see and eat at the same time, we seem to be only able to attend to, or be directly conscious of, one particular experience at any one moment. This observation also seems to apply individually to each form of consciousness, like visual awareness, auditory awareness, or somatosensory awareness. In the case of visual awareness, we seem to be only able to focus our gaze on a small patch (in a cone of diameter 0.5 degrees; or the size of a thumbnail at arms length) in our visual field. Although we are able to maneuver from one patch or object in our visual field to another very rapidly (on the order of every

one tenth of a second or less) we are only able to attend to the precise detail and be directly conscious of the detail in one small patch at any one time. Try this experiment by looking at two words on this page that are separated by a few inches. As you focus on one of these words the other goes out of focus, and when you swap your attention to the other word, the original word goes out of focus. Similarly we can only think about one thing at a time, or properly attend to one sound source at a time, even though our brain is simultaneously processing many different sounds. An interesting flip side to this serialization property of consciousness is that we are able to use this mechanism to divert our attention to a single item such as; listening exclusively to someone we know singing in a choir, looking at someone in the crowd, or even reading text on a page. Such a mechanism is also operative when we are talking to someone in a noisy environment. The brain essentially filters out all other sounds from consciousness.

The serialization of consciousness suggests that there is an intense competition for attention between the various attractors simultaneously present in the brain with winner-take-all. The winner-take-all mechanism may also be facilitated by the fact that locally, neurons and networks tend to inhibit each other. This means that patterns stored in the same network, and neighbouring networks are in competition with each other, while still allowing for the simultaneous excitation of more distant networks. This is interesting because similar memories are probably stored in similar neighbouring areas in the brain, and so this allows us to differentiate them. On the other hand, long-range pyramidal neurons tend to be excitatory, and this facilitates the simultaneous activation of neural networks in distant areas of the brain, which may correspond to the features that are bound together to make up a complete memory.

Another example of the serialization of consciousness is afforded by the well-known visual illusion in psychology, which can be either construed as two faces facing each other or as a vase between them. One can only see (meaning attend to) one of these two images at any one moment, One's attention can swap from the vase to the faces and vice versa, but one cannot see or attend to both images simultaneously. A similar effect is observed in the Necker cube (Figure 4.1) where there are two possible choices for the front face of the cube, two mutually exclusive interpretations. This clash of two possible interpretations is also indirect evidence of attractors in the brain, as one attractor wins over the other, and attention swaps repeatedly from one to the other.

**[insert Figure 4.1 about here]**

From the above discussion it is clear that consciousness is intimately linked with attention. Various attractors and ideas in the brain are competing for attention, and the thalamus may have something to do with deciding which attractors win out. A side effect of this competition for attention is that, if we are distracted by something

(such as our thoughts, pain, or anxiety), it becomes difficult to perform other functions efficiently. This would help explain the phenomenon of the 'absent minded professor', where the professor is clearly preoccupied with his research thoughts and subsequently forgets other everyday things he is supposed to remember.

This distraction can happen consciously, by affecting our concentration, or even subconsciously, by diverting neural resources, like the available neural charge. The amount of available neural charge is probably not fixed, as the brain can open more synaptic gates, by increasing the level of certain neurotransmitters. This allows more neurons to get excited, which in turn can excite even more neurons, resulting in an overall increase in neural activity. The brain probably uses such mechanisms to control its activation levels during waking and sleep. Anxiety was mentioned above as a possible source of distraction, but can also act as a stimulant to heighten or concentrate one's focus. Athletes thrive on it in competition, students use it to push themselves during examination periods, and one tends to get a lot more work done when one is a little anxious. Anxiety probably works by increasing the overall neural activation levels, so does not impinge on the available neural resources. Over excitation of the nervous system, through over-anxiety, may however have a detrimental effect in that there are now too many attractors competing for attention.

The intense competition for attention may also be the basis for the fleeting character of consciousness, whereby our attention swaps from one form (or aspect) of awareness to another. It is interesting to note that although we experience each of our senses in snapshots, this seems to be sufficient for us to maintain effective awareness, and subsequent control, over our environment. Some functions, such as walking, eating, swimming, and even at times driving a car, can proceed for prolonged periods without much recourse to consciousness, once they have been properly encoded into memory. One may speculate that the serialization of consciousness may have an evolutionary advantage in that it prevents the brain from becoming confused as it responds to various, persistent environmental stimulation.

Another interesting property of consciousness is the so-called 'stream of consciousness', which refers to the apparent continuous drift and flow of attention from one related thing to another. Generally this stream connects similar related aspects of memory or awareness, while at other times it may involve a shift to a new type of memory or awareness. When there is a switch in context, and our attention returns to the previous type of memory or sensory processing, it generally picks up from where it was, before the switch. Attractors are suitably placed to explain this phenomenon. An attractor, or active memory, would itself tend to predominantly excite other related memories (associative memories), but now and again a completely different set of attractors or memories may become prominent with the intense competition for attention and the steady stream of new sensory input. This tends to drive the system towards new brain states. Furthermore, when we lose

attention to some brain-state, its attractor still reverberates in the network for a short time longer (around 16 seconds in the Miyashita experiments with primates; see Chapter 3), so it can be re-entered when our consciousness swaps back to this aspect later. This may have something to do with our ability to swap between many different tasks ('multi-tasking') while still maintaining some cohesion with what is going on. Note the input that the brain receives, itself has a certain continuity associated with it, and it may be that the 'stream of consciousness' is also a reflection of the 'stream of input'.

Although consciousness is mainly a serial process, some people claim that they can perform two tasks at once. An old television show, about the American folk band 'The Band', shows the organist Garth Hudson, quite remarkably playing two different tunes at the same time, one with each hand. On a more trivial level, many people can, with a little practice, rub their tummy with one hand while they pat their head with the other, without mixing up the two actions. Then they can pat their tummy while they pat their head, or rub their head while they rub their tummy. At a recent exhibit at the Toronto Science Museum, it was mentioned that people were only admitted into the 'Chinese Civil Service' (an old political organization in China) if they could simultaneously draw a circle with one hand whilst they drew a square with the other (Mike Haffendon, private communication). One could perform these tasks if one was able to swap one's attention from one task to the other quickly enough, so as to maintain effective control over both actions, and with sufficient dexterity not to mix the two tasks up. Alternatively these actions may be performed simultaneously if we were able to remove ourselves (or the 'self'; see subsequent discussion in this Chapter) consciously from them. The problem is that the 'self' interferes by over-judging each of these actions, and with our ability to swap from one task to the other. Try performing the rubbing/patting or the circle/square exercises with this in mind, or more appropriately out of mind.

The above examples relate to similar tasks, both involving the hands and both relating to a conflict between the left and right halves of the brain. There are also examples involving different senses. We do not know however if genuine simultaneous multi-tasking exists or whether these tasks are simply performed by swapping our attention backwards and forwards between the various tasks.

#### **4.7 The unconscious mind**

It is clear that much of what goes on in the brain does not enter consciousness. In other words, there is an unconscious mind, or a subconscious, as first suggested by Sigmund Freud. The brain reaches many attractors and decisions that we are simply not aware of, and much processing is devoted to the control of our bodily organs and our internal physiology. There is much other neural processing that does not enter consciousness. For example, our brain is constantly receiving visual and auditory data from our senses, such as information relating to objects in our peripheral vision or background noises that it processes but which we do not become directly conscious of, unless we divert our attention to them. Incidentally this helps to

explain why we can suddenly move our visual attention, for example, to something else in our visual field without dragging blurred images across our retina. The brain has already processed the necessary information in our complete visual field and this information is awaiting our attention when we wish to observe it. This is interesting because it suggests that we are conscious of only a fraction of the information that we process. This may be important when one contemplates the memory storage/capacity experiments of Landauer, mentioned in Chapter 3. Landauer's experiments are focused only on the conscious part of what the brain is processing, which in terms of the visual field is quite tiny. As noted earlier, we are also unaware of the sub-processing (for example in the extraction of features of the objects we see) and of the actual processes by which attractors are attained.

There is other evidence of a subconscious. Sometimes we cannot remember someone's name, or a certain fact. We start to think about it, eventually giving up, but then some hours later, the name or the fact that we were seeking, suddenly comes to us out of the blue. This suggests that the unconscious mind was busy trying to resolve this problem. Another example is that we often hear people repeat something that someone else just said a few seconds or minutes earlier. This may happen because the person who repeats what was just said, actually heard what was said (that is his brain processed it), but it did not enter his consciousness that it was heard. Some time later the 'idea', or attractor corresponding to what was said, suddenly surfaces in the mind of the bad listener and they say it, believing that they had the idea themselves.

Subliminal messages advertising certain products were at one time flashed on movie screens for a fraction of a second (so quickly that they did not enter consciousness) so an attractor may have been attained, but was not observed by consciousness. Yet the message or information was still processed by the brain, and subsequently lead to other attractors in the brain, which made the audience feel a craving for that product during Intermission, without knowing why. Such practices are now banned.

There are some blind people who experience the phenomenon of 'blindsight' where they appear to respond to visual stimulus although there is no visual awareness (Weiskrantz 1986; Weiskrantz and Warrington Sanders, and Marshall 1974). In these experiments the blind subjects are asked to choose between a number of alternatives corresponding to what is placed in front of them. The subjects usually think that this is a ridiculous thing to ask them, because they cannot see anything, and they reluctantly have a guess. What is remarkable is that they are significantly more often correct than not. People with 'blindsight' generally have normal healthy eyes, so much of the visual information gathered still enters the brain, but for some reason their (primary) visual cortex is dysfunctional, and usually on one side of the brain. A possible explanation for 'blindsight' is that an attractor in the visual cortex may not have been fully achieved or detected, or simply did not win for conscious attention.

Therefore, there is no visual awareness, yet there is sufficient information generated in the visual cortex to trigger neural processing in other parts of the brain, which may result in the 'correct' response.

Some other automated actions such as walking, riding a bicycle, and playing tennis can proceed without entering consciousness very often, other than for brief intermittent moments. These memories are called non-declarative or implicit memories (sometimes also referred to as 'muscle memory'). Although they do not generally enter consciousness they probably did when we first learnt how to perform these actions (Squires and Kandel 1999). When we first learn to ride a bicycle we have to consciously think about what we are doing as we alternate the use of our legs to push the peddles and learn to control the delicate and potentially unstable steering system. After this has been well and truly learnt it rarely enters consciousness again. This does not mean that we cannot focus our attention on these automated functions. We can, but thinking about what we are doing, for example when we ride a bicycle, later, may even cause us to fall off. Similarly, if we think about playing a tennis shot too consciously we will probably miss-hit the ball (Squires and Kandel 1999). Once these functions have been encoded into long-term or permanent memory it seems best to use them more instinctively. Note that although we are generally not aware of some of our automated physiological functions, such as our heartbeat, we can divert our attention to them if we want to. In other words, some aspects of non-declarative memory can be brought back into consciousness. It is probably also true that even non-declarative memories require some level of conscious attention from time to time.

As noted earlier, a very good reason why a considerable portion of brain activity should not enter consciousness is that this stops the brain from becoming confused. Just imagine what it would be like if we had to be conscious of everything that was going on around us.

#### **4.8 Consciousness and learning**

Memories that enter or re-enter consciousness are called declarative memories or explicit memories. They are usually separated into two types, semantic memory, or memory of facts (such as Perth is the capital city of Western Australia), and episodic memory, which is more personal memory relating to ourselves and time (such as, what you had for breakfast this morning). As noted above, some declarative memories, particularly those involving motor actions and skills can, with practice or repeated exposure, be slowly converted into non-declarative memories. The process of taking old well-known declarative memories out of consciousness is quite desirable, as the brain does not need to consciously attend to information that it has mastered, and can focus its resources on new and potentially more important information.

It also appears that a state needs to enter consciousness a number of times before we actually learn it, and it can be stored away into memory. In terms of Hebb's rule (see Chapter 3) learning takes place when the same set of neurons fire persistently and concurrently, that is, reverberate together, such as when an attractor is attained. The more often an attractor is achieved, or recalled, the stronger is the capacity to learn that attractor or memory. In other words, learning is facilitated by the repeated recall or repeated presentation of a memory. Somehow this process is also enhanced or accelerated if the memory or attractor is attended to and brought into conscious awareness. On the other hand, the repeated recall of a memory, and its subsequent learning (which may be regarded as a natural Hebbian process) may be what brings this memory to conscious attention, in which case consciousness does not really play a part in learning, but is just coincidental with it. Attractors that go undetected, that is do not enter consciousness, are generally not learnt, although there is some evidence, mainly coming from amnesic patients, that some form of learning can still take place without conscious awareness ( Warrington and Weiskrantz 1974; Benzing and Squire 1989).

Another interesting connection between consciousness and learning is that learning seems to be facilitated by the distributed excitation of the two neurotransmitter systems, norepinephrine and serotonin, in the brain. These neurotransmitters are known to peak when we are awake (and acutely conscious) and are at their ebb when we are asleep and consciousness is largely absent.

The serial nature of consciousness may be required so that the brain does not become confused about what it is learning. This would help to avoid any false correlations between different unrelated memory states.

#### **4.9 Consciousness and short-term memory**

Consciousness seems to be intimately linked with some form of short-term memory, whereas medium and long-term memory are largely unconscious processes (James 1890). This does not mean that we cannot become conscious of our old memories, but just that we are directly conscious of what has just transpired in our brain. This link is thought to be so strong that at one time psychologists did not, and some still do not, distinguish between consciousness and short-term memory. There is also a slightly longer form of short-term memory, called working memory, which is synonymous with the famous limitation of short term memory to  $7 \pm 2$  items (Miller 1956), and is initiated when, for example, you try to remember someone's phone number. Working memory is thought to be located somewhere in the prefrontal lobes, at the front of the brain, where volition and logic are located.

Long-term memory, which is stored in the synaptic efficacies, is only involved with

the dynamics of the recall process, and unless that memory is itself recalled, it does not enter into short-term memory. Short-term memory corresponds to the most recent and current memories or attractors that have been recalled or attended to by the brain. These are the memories we are likely to become conscious of. Note that after a memory has been recalled, its essence remains in the brain for some time later and may itself lead to the recall of other associatively related memories. These memories that have just past are then relatively easier to re-access because they are either still present in the brain, or some other memories related to them are now reverberating in the brain. This can act as working memory.

Indirect evidence for a link between consciousness and short-term memory also comes from the famous patient H.M., who had part of his temporal lobes and his hippocampus bilaterally removed. As noted in Chapter 3, the hippocampus and the temporal lobes are important for storing away recent memory into medium and long-term memory. H.M. is unable to do this and consequently is only aware of what he is currently attending to. When his attention is diverted to something else, H.M. has no recollection of what he was doing. H.M. is literally living the moment. H.M. is unable to lay down medium and long-term memory, but still has short-term memory and appears to have consciousness (Scoville and Milner 1957).

#### **4.10 Brain chemistry and consciousness**

There are numerous drugs that influence consciousness directly or indirectly. As Allan Hobson points out, the conscious states of the brain are influenced by fluctuations and changes in the neurochemistry of the brain (Hobson 1998). We experience different states of consciousness during a 24-hour day. When we are awake, the neurotransmitters serotonin and norepinephrine are particularly active, and are thought to facilitate memory recall and learning, while when we are dreaming, the level of these two neurotransmitters subside and the cholinergic neurotransmitters become prominent. Both the aminergic and the cholinergic chemical systems seem to be subdued during deep slow-wave sleep, when consciousness is largely absent. Hobson suggests that these chemicals play an important part in consciousness.

When we are awake we have an acute level of consciousness with access to all of our memories, whereas during dream sleep we have a transient disoriented form of consciousness without recourse to our usual memories and logic centres. Dreaming consciousness can be quite intense and emotional, since the brain is still quite active (see below) and the limbic system, which includes the amygdala (the centre for emotions), is heavily stimulated. It would then appear, that drugs like Prozac, which essentially increases the levels of serotonin in the brain, should enhance waking consciousness and learning capacity. Prozac is a serotonin re-uptake inhibitor that keeps serotonin levels higher by retarding the processes involved with re-absorbing the previously released serotonin back into the presynaptic vesicles. Hobson advocates (possibly in jest) that this may be one of the reasons why so many high-



fliers in New York take Prozac, to get the memory edge over others, but the main reason why they may actually take this drug is as an antidepressant. Hobson's ideas about the importance of neurochemistry in consciousness offers a nice explanation of why waking consciousness and dreaming consciousness can be so different, even though both are highly active brain states, involving the same brain. This suggests that activation alone is not a measure of consciousness.

Activation levels are quite important in relation to consciousness, although one may argue that the activation levels of the brain are really controlled by neurotransmitters and neuromodulators. If the activation falls below a certain level, consciousness is lost or subdued, such as when we fall asleep or when we are anesthetized. Sleeping tablets, antihistamines and alcohol generally lower activation levels by causing neural incoordination (equivalent to noise) or impaired processing. As is well known, caffeine has the opposite effect and stimulates the central nervous system and consciousness. Consciousness can also be subdued or altered if the activity of the brain is too high, such as when an epileptic patient is having a convulsion, when someone has overdosed on drugs, or when we have a massive headache (which is now thought to result from strong electrical waves sweeping across the brain).

During waking consciousness the brain is stimulated by sensory input collected by our eyes and ears for example. During REM sleep this sensory input (see discussion in Chapter 6) is replaced by semi-random stimulation generated from within the brain (in the brain-stem). Dreaming results as the brain tries to make sense of this noisy stimulation. During slow-wave sleep the activation level of the brain is lowered considerably, and there is little (if any) stimulation from inside the brain or from the outside world. Hobson further suggests that the thalamocortical oscillations, which result in the low frequency large amplitude waves seen in the EEG associated with slow-wave sleep, may explain how the brain swamps out external sensory and internal input, and subsequent processing, during this phase of sleep.

The question of activation level is interesting from a neural network modelling perspective. Generally neurons have a threshold and must receive almost simultaneous input from about one hundred to a thousand other excitatory neurons before they fire. A natural consequence of this is if lots of neurons start firing then even more will get excited and fire in turn, and if lots of neurons are quiescent, then lots of other neurons will also become quiescent. In other words, neural networks are unstable to hyperactivity (they continue to get over excited) and under-activity (they tend to close down completely). The brain is thought to get around this problem via neuromodulatory stimulation and suppression, which is also controlled by cells in the brain-stem. When the brain is subdued, attractors are less likely to form, hence less consciousness, and when the brain is hyperactive, there are more attractors that are competing for attention, hence also resulting in less attentive consciousness.

Hobson et al have proposed that there is a reciprocal push-pull mechanism that is at

work between the aminergic and cholinergic neurotransmitter systems that takes us through waking and sleeping brain-states. (Hobson, McCarley and Wyzinski 1975; Hobson 1988, Hobson 1998). One of their suggestions is that the cholinergic activity during sleep allows the brain to replenish its aminergic stores for the next day, which are essential for learning and consciousness. It is interesting to note that one tends to be unable to concentrate and learn the day after a bad night's sleep, which are hallmarks of a subdued consciousness. According to Hobson, this is because our brain has not fully replenished its aminergic neurotransmitter stores, which are essential for learning and conscious awareness.

On general grounds, most drugs may influence consciousness by influencing the processes whereby attractors are attained in the brain. In some cases, the drug may affect our ability to recall certain memories by adding unwanted noise, or it may completely change the structure of the attractors or memories that can be recalled. Also, as discussed in chapter 3, it seems that certain memories are not recallable while we are influenced by certain drugs (such as alcohol or marijuana), and there are certain memories which are laid during the drug affected state that are not recallable when we are 'sober' or no longer 'high'. As a trivial example, when we are 'drunk' we may not be able to recall the name of someone whom we know quite well, and when we are sober the next day we may not remember much about last night. You would not say that the person was not conscious during these outings (unless they were 'rotten' drunk, of course), although their consciousness is certainly affected in the way that they perceive things and the information they store. If one is recalling a different set of memories, corresponding to different attractors, when they are sober or drunk then in some sense they are acting like they are different individuals. [This is probably one of the main reasons why people take drugs, to escape from their usual reality.] Other drugs may influence our mood and emotions, which in turn are known to influence our learning ability and conscious perception. The influence of drugs on the brain is obviously much more complicated than may have been originally anticipated as there are some thirty main neurotransmitters, with even more neuroreceptors and secondary messengers, and drugs may mimic or block aspects of more than one brain chemical.

Two drugs in particular, LSD and mescaline, are said to lead to a profound state of self-consciousness, or reflective awareness. They were extremely popular in the 1960's, especially before there were laws forbidding their use. Even scientists in California were 'experimenting' with LSD during this period. What is special about LSD and mescaline is that they have similarities with the two neurotransmitters serotonin and norepinephrine respectively, which are prevalent during waking consciousness and are implicated with learning. This provides yet further secondary evidence for a link between consciousness and learning. Note that serotonin (see Chapter 6) is an inhibitory neurotransmitter that is subdued during dream sleep and this is thought to partly explain the bizarreness and disorientation associated with dreaming. During waking consciousness serotonin helps to restrain the brain from running out of control through its inhibition.

It was once thought that waking consciousness requires sensory input to be maintained, but it is known that consciousness remains during meditation (when subjects try to block all external sensory input), and in the isolation-tank experiments performed by John Lilly (Hooper and Teresi 1992; Lilly 1977). What may be happening here is that, although sensory input may be reduced, the brain is still receiving small amounts of stimulation from certain parts of the brain-stem when we are awake, just as it does when we are dreaming. It is just that this input is swamped out by sensory input normally, so it is not usually noticed. Hobson suggests that a certain level of activity is required to maintain consciousness, so the level of brain-stem stimulation may also increase, when sensory input falls below a certain level.

Another interesting brain state that can occur during dream sleep is when one becomes conscious during the course of a dream, and subsequently 'wakes up' within the dream. This is referred to as 'lucid dreaming' and is discussed in more detail in Chapter 6. Hobson suggests that lucid dreaming occurs when certain aminergic neurons in the forebrain, where our logic centres are located (such as the dorsolateral prefrontal cortex), compete with the REM based cholinergic neuron in the limbic system (Hobson 1998). This competition between these two neurotransmitter groups is so delicately poised, that if we get too excited during a lucid dream, we will wake up, which means that the aminergic system wins out.

#### 4.11 Self-awareness and the 'self'

When we have addressed the question of consciousness we need to explain how it is that the human brain is also capable of being aware that it is aware, how is it that we are able to influence our own state of mind (for example by directing our brain to recall a certain fact or memory), and, what is 'free will'? The simplest explanation is that self-awareness may just be a natural extension of awareness, combined somehow with language and reasoning. If we are aware of our surroundings, then we should probably also be aware of ourselves (in body and mind) as being part of those surroundings, and hence of our awareness. Self-consciousness may then just reflect our ability to make a model of ourselves in relation to the rest of the world, in our own heads, and then use this knowledge as a self-referencing system (Blackmore 1989). Such an interpretation of the 'self', as a mental model, offers a plausible explanation of many aspects of self-consciousness, such as why the 'self' cannot be physically located in the brain, as well as some strange phenomena like 'out of body experiences', such as when a patient imagines that they can see themselves from above lying on an operating table. What may be happening here is that they (their brain) are making up a story that involves their model of a 'self', which fits in with the other sensations that they may be still experiencing, such as what the doctor's and nurses are talking about during the operation. This view of the 'self' also suggests that there is no real distinction between consciousness and self-consciousness. Multiple personality disorders could also be understood in this explanation of 'self', as corresponding to situations where someone has more than one model of a 'self',

and as we suggested in Chapter 3, this may have something to do with having different memoryscapes, corresponding to different brain chemical states.

Language seems to play an important role in self-consciousness, as we seem to be constantly talking to ourselves when we plan actions, think, and rehearse scenarios in our head (Edelman 1989). This is one of the underlying reasons why we imagine there is someone inside of our head, because we feel that we are really conversing with someone else. The possible link between self-consciousness and language is interesting, because it may suggest that other mammals, which may well have consciousness, but not language, probably do not have self-consciousness, at least to the extent of humans.

Language may also be fundamental to consciousness itself. Roger Sperry (who performed the neural specificity experiments on the optical fibres of fish and frogs, discussed in Chapter 2) and Michael Gazziniga have examined split-brain patients who had their corpus callosum connecting the two hemispheres severed (Sperry 1961, Gazziniga 1967). What they found is that these patients are still conscious. One may argue that they even have two minds, but what happens is that the side of the brain where language is stored or processed usually wins out. Some controversy remains as to whether the other side also has consciousness or is just an automaton. In carefully designed experiments, these patients were shown different images to their left and right visual fields, which are respectively processed by the right and the left hemispheres of the brain. [Recall that the left side of the brain controls the right side of the body and what we see in our right visual field, and the right side of the brain takes care of things to the left side of our body and our left visual field.] In one famous experiment a patient was shown a snow scene with a cabin on his left side, and a chicken claw on his right side. This means that the left side of his brain sees the chicken claw and the right side sees the snow scene. The patient was then asked to choose from a range of physical objects placed in front of him. The left hand (which is controlled by the right brain) chose a spade (to go with the snow scene), and the right hand (controlled by the left brain) chose a chicken (to go with the chicken claw). When he was asked about why he made these choices, he said that the chicken went with the chicken claw, and that the spade was needed to clean out the chook pen. What happened was the dominant left side of the brain (the side of the brain with language) had fabricated a story about why the left-hand (right brain) had chosen the spade.

The story of Nico, a boy who had a functional hemispherectomy, also highlights that we do not need both sides of our brain for functionality and for consciousness (Battro 2000). Nico suffered severe epilepsy and had to have practically the complete right hemisphere of his brain removed. Nico made a remarkable recovery and appears to be functioning almost as normal with only half a brain.

Our orientation, that is, our sense of place and time, and our memories are also important for our self-consciousness. We need to know where we are, when it is, and who we are, to properly reference ourselves. Incidentally, this is one of the reasons why self-consciousness is largely absent during dreaming, because we do not have full recourse to our episodic memories and logic systems. Dreaming is typically associated with a state of complete disorientation and of a highly delusional disposition.

As noted earlier, short-term memory is important for consciousness. Our medium and long-term memories are important for self-consciousness. We are our memories, and any loss of our memories is a loss of our personality and our personal history. These memories are then not available to the 'self'. This represents a loss of self, especially if the self is considered to be a model of oneself in relation to the rest of the world. As we saw in Chapter 3, the famous patient H.M. who had part of his temporal lobes and his hippocampus bilaterally removed, still has short-term memory, but is unable to lay down medium-term and long-term memory. H.M. may well be conscious of the moment that just passed but since he cannot lay down medium and long-term memory he has no recollection of that part of himself from the past. This loss of his personal history detracts from his full self-conscious awareness. Amnesic patients, who have lost their memory, do not know who they are. That part of themselves is missing.

As mentioned earlier, self-consciousness gives us the impression that there is someone or something inside our head, like a little man or 'homunculus', as he is often called, who is observing the 'projection screen' in our brain, and who is controlling our actions and making decisions and plans for us. See Figure 4.2 for a sketch of this mythical character, whose bodily dimensions are shown in approximate proportion to the area in either the somatosensory cortex (relating to sensations, like touch, pain and temperature), or the motor cortex (relating to movement), that is devoted to each of these bodily parts. For example, the homunculus has large hands, as lots of neurons are used for feeling and moving with our hands. If we were to allow for other functions of the cerebral cortex, such as thinking, vision, hearing, and other self-conscious processes, this homunculus would probably have a gigantic head, with enormous eyes and big ears, and a much bigger penis (in the case of a man). 'We' are of course that little man inside of our heads. The idea that someone is observing and controlling our minds is actually quite illogical because the homunculus would also need eyes, ears, a brain and a 'self' to observe what is going on and make decisions for us.

**[insert Figure 4.2 about here]**

In addition to the projection of a 'self' inside our head, we also project a 'self' into all of our body, into our torso, our legs, our arms, our hands, and our fingers. For example, we experience pain (which is just another form of consciousness) in the part of the body that has been damaged or injured, and not in the brain or the spinal cord where it is actually perceived. We also project images which are processed in our brains, as if they are standing majestically out there in front of us, like holographic images, with perspective and everything else. Sounds are also processed in our brains yet we imagine them too to be coming from a source out there in front of us (or behind in this case). This is all a part of our 'self' and is quite remarkable when you stop and think about what is going on. All of these things are perceived in the brain but experienced outside of the brain.

If you ask someone, where 'they' are? (referring of course to their 'self'), they may reply that they are in their heads. It is difficult to ascertain how much their answer is influenced by common present day knowledge about the brain and the mind. When I asked two of my children this question, they initially pointed to their torsos, telling me that they were in their bodies. When, however, I asked them to really think about it, they replied that they were in their heads, somewhere between their eyes and ears. We would assert that the 'self' is where the most current neural processing is taking place, where our attention is currently attending, and if you 'think' about it, you are more likely to answer "in my head". The head is of course also special as there are so many sensory inputs located there, such as the eyes, ears, and the nose. What was interesting for me was the instinctive answer that my children gave, because we need to remember that up until a couple of hundred years ago, it was thought that the mind was in the heart, indeed we still use the saying "with all my heart" when we really mean "with all my mind", or "with all my brain". [Actually some people do still believe that the mind, or part of the mind is in the heart, especially some religions.] Sometimes, after strenuous exercise we feel as if our 'self' is located in our bodies, in our burning legs and arms or in our chest and puffing lungs, or in our pounding heart, and less so in our head. Incidentally, one of the reasons why we may use the saying "with all of my heart", particularly when it comes to matters relating to love, is that when we are excited by someone of the opposite sex (or the same sex in today's society), our heart generally starts to pump faster as we get excited. The saying is however erroneously used when we really believe in something.

Blackmore suggests that at times the 'self' can even inhabit the bumpers of our car (Blackmore 1999). We wince if we just miss something, but a skeptic may say this is because we know how expensive it is to repair cars. When we do things like turn wood on a lathe we sometimes feel, for brief moments, that our 'self' is in our hands, or even in the chisels we are holding. Another example of this phenomenon is when we are watching a football match (Australian Rules, of course) and one of the players in the team we support has the ball and is about to be tackled. When he sucks his back in, to avoid being caught, we tend to also do this. In a televised cricket match

we may duck a ‘bouncer’, which is a short-pitched delivery whose bounce is aimed at the head of the batsman.

The world around us as we see it, with all of the objects in front of us, is a reality that our minds have created for us and us alone. One can argue that this too is part of our ‘self’. It is our own little world, and there is no reason why anyone else should see it in exactly the same way as we do individually. We do not know for example if we see the same redness in red. If we literally think about it, we might say that the ‘self’ is located inside our head, but the ‘self’ can also be in our bodies, in the world we perceive, and also in our memories and beliefs.

Another strange effect associated with self-consciousness is that, with familiarity, something can become a part of our ‘self’. If we go back to the example of the car bumper, above, when the ‘self’ can inhabit the bumpers of our car, we would assert that this only happens if we have driven that particular car often. One experiences a similar phenomenon when one rides the same bicycle over a long period of time. With intimate familiarity the bicycle may become a part of the person, like an extension of the self, in much the same way that our clothes and jewellery can become a part of us. In other words, it appears as if the ‘self’ grows and extends its boundaries as we become familiar with those surroundings, incorporating experiences relating to the transition of declarative memory into non-declarative memory. We no longer have to think much about these things consciously, they have been incorporated into our model of ‘self’. This offers a slightly different and somewhat paradoxical perspective of what ‘self’ is. It treats self-consciousness and consciousness as different, almost orthogonal entities.

Many artists, writers and scientists, in particular, and others of course, sometimes enter a state of intense concentration or deep focus where they literally lose themselves in their work. During this state of mind, which is called ‘flow’ by the American psychologist Mihalyi Csikszentmihalyi, people engage in a deeply satisfying interaction with their surroundings (Csikszentmihalyi 1990). During such experiences one feels as though they are in perfect synch or harmony with whatever they are doing, which may involve producing a substantial work of art, writing a chapter for a book, writing a song, or even just turning a piece of wood on the lathe. [Hopefully you may be experiencing this phenomenon right now while reading this book.] ‘Flow’ is a state of intense focus of consciousness, where one escapes from the usual fleeting nature of consciousness, concentrating all attention onto a single specific task. In this state, one also escapes the mentally incapacitating restrictions of self-consciousness, or awareness of ourselves in relation to our surroundings and what we are doing. As noted previously, when turning a piece of wood on a lathe, for example, one may even feel as if the ‘self’ has moved from the mind into our work, our hands or our chisels.

The phenomenon of 'flow' gives us some new insights into how consciousness may be involved more directly with a dynamical feedback mechanism, that the brain may use to adjust its responses, and what it is learning, in relation to what it is simultaneously experiencing and doing. In this way, the brain develops a closer relationship between observation and reaction.

Self-consciousness seems to be important for social interactions and in the running of a civilized society. Self-consciousness gives us a sense of how we fit in with the rest of the world (and others) and so gives us the ability to imagine what it would be like to be someone else, and hence also enables us to develop feelings like compassion, admiration, and trust. Humans are very social, caring and altruistic, but nature programs on television invariably show that other mammals like elephants, gorillas, and chimpanzees, for example, and even ants and bees are also very social creatures. Do these animals have a sense of 'self'?

The 'self' is synonymous with the mind and the soul. The inherent difficulty in pinpointing the 'self' inside of us, combined with our lack of understanding of what the 'self' is, may have something to do with why so many people, including scientists, become religious.

#### 4.12 Directed recall of memory and 'thinking'

Whatever self-consciousness may be, it seems to give us the uncanny ability to recall memories that 'we' want to recall. We can 'direct' the recall of a specific memory, such as the forgotten name of someone we know, by placing cues into our 'mind's eye', or with the 'self', that are known, or thought, to be related to the sought-after memory. This directed search for a specific memory may take a few seconds to a few minutes, but sometimes the answer comes back to 'us' hours later, when we are not even thinking about it anymore. These delayed responses support the notion of an unconscious mind. How exactly the brain is able to place cues in the mind to instigate a search is a mystery, but we would suggest that once a cue has been placed in the mind that this 'input' drives the system, until eventually it reaches another attractor, which may then start off further processing using this attractor as an input, and so on until the desired attractor, corresponding to the sought-after memory state is recalled.

How we know when the correct memory is actually retrieved, is not well understood. Presumably the brain is cross-checking the various attractors it is obtaining against other bits and pieces of knowledge that it holds, concerning the sought-after memory. Maybe we 'know' when, because when sufficient information about this person has been recalled, it causes an avalanche of other information about him to come flooding back to us. We suddenly know this person's name, and everything else about him such as; what he normally looks like, how he acts in front of other people, what this person does for a living, what sort of person he is, and maybe also recollect something of a recent conversation with him.



As noted in Chapter 3, attractors have been observed in the brains of monkeys (in the anterior ventral temporal cortex in these experiments), which can persist for around 16 seconds or so (Miyashita 1988; Miyashita and Chang 1988). The persistence of these reverberations, or their offspring (that is, other attractors that the original attractor may have inspired), may be the basis by which we can hold memories in our mind, or short-term memory, or use them for further processing and memory searches.

The process of thinking is probably very similar to the process of directed recall from memory, or bringing information into consciousness. When we are thinking, we are placing certain attractors or cues into our 'mind' and allowing the brain's neural network systems to evolve from one attractor into another attractor, which we somehow compare, using other attractors, 'ideas' or knowledge, to ascertain if a solution to our problem has been found.

Another interesting and somewhat related aspect of brain function is that of 'positive thinking'. It is widely accepted nowadays that positive thinking can have very beneficial effects. If you tell yourself that your health is good, you will feel better as this feeds back into your physiological system, remembering that the brain does control the body to a large extent. There are so many examples where positive thinking has been beneficial to people suffering from incurable diseases, that this phenomenon cannot be ignored. There is no doubting the power of the mind. What probably happens when you tell yourself something positive (or negative for that matter) is that it generates an attractor in the brain corresponding to that notion, in much the same way that it generates one when you insert a cue to find a sought-after memory. This attractor is then processed by the brain, which could lead to subsequent positive (or negative) feedback on the mind, brain and body. The equivalent of 'positive thinking' can also be used to influence the mind of others. Making suggestions to other people can influence their behaviour. This happens in everyday life, but a classic example of where this is used in practice is in hypnosis.

The human mind is extremely mindful. always thinking about things around it. It is inconceivable that other animals think as much as what we do. Thinking requires a certain amount of knowledge and things to think about. As we have mentioned previously the thinking process is itself reliant on previous knowledge as it involves the spurious memories, which themselves are made up from combinations of stored memories. It is not possible to think about something that you know nothing about. If we are the only mammals to think so much we need to explain why it is that we are so different to other animals, and the answer invariably points towards memes again.

#### 4.13 Are animals conscious?

Most mammals have a similar brain structure to humans. They have a cerebral cortex, and some of the other brain structures like a thalamus, a hippocampus and an

amygdala, so presumably they may also have consciousness, or at least some form of primitive awareness. Pets clearly display emotions and feelings that are reminiscent of human consciousness. When a dog does something wrong he seems to know it when he is confronted by his human master. He holds his head down, puts his tail between his legs, whimpers and portrays sorrow and regret with his droopy eyes as he wallows towards the feet of his master. Emotion is a particular form of consciousness, and since most mammals seem to have an amygdala, they are likely to at least have this form of consciousness.

Humans, on the other hand, have enormous brains and a much bigger cerebral cortex than most other mammals. Scaling for body-size the human brain is three times larger compared to the chimpanzee, our closest relative. Most of this increased neural tissue is in the neocortex. The human cerebral cortex (or neocortex) is about 2-3 millimeters thick and has an approximate area of about 1000 square centimetres [or 0.1 square metres], which is about the size of a large handkerchief. The cerebral cortex of the macaque monkey in comparison is about one-tenth the size of that of humans, with an area of around 100 square centimetres, about the size of a drink coaster. Humans however do not have the largest brains. The elephant and the whale have a brain weight about 5 times bigger than humans, but their brain weight to body size is about one tenth to one hundredth that of humans. Brain weight to body size cannot be used as the definitive measure of our neural superiority as this ratio is slightly higher in a mouse compared to a human, and for some small birds this ratio is about three times bigger. The key difference seems to be the size of our cerebral cortex per body weight compared to other mammals.

The much larger neocortex gives humans their unparalleled higher-level brain function abilities such as thought, language, planning, volition, and self-awareness. John Lilly, the renowned 'dolphin man', however, has discovered that the bottlenose dolphin has a slightly bigger brain than humans and a more convoluted cerebral cortex. This probably reflects their longer period of evolution, and may be associated with some form of higher-level intelligence (Lilly 1967). Dolphins are highly intelligent creatures. They often seek human interaction by approaching them on beaches and alongside boats. It is also thought that dolphins have some language capabilities. However, dolphins are now not thought to possess self-consciousness.

To determine whether presumably 'intelligent' mammals, such as the chimpanzee or the dolphin, have self-awareness (that is a concept of themselves), researchers have placed markings on the heads or bodies of chimpanzees and dolphins and have then observed them as they observed themselves in mirrors (Gallup 1970; Gallup 1998; Marten and Psarakos 1994). If these animals spend more time observing themselves in the mirror compared to unmarked animals then this may advocate they have self-consciousness. Gallup however suggests that the animal also needs to touch or rub the spot, to show that it is aware that the spot is actually on its own body. In the case of the bottlenose dolphin, the dolphin would need to try to rub the spot off by rubbing its body against the mirror. The current situation is that the chimpanzee and the

orangutan pass this test, monkeys fail the test, whereas the situation is not clear (but leaning to the negative) with the bottlenose dolphin (Gallup 1998; Miles 1994; Yam 2001).

As noted in Chapter 3, chimpanzees behave in many ways socially just like humans, and as we noted earlier in this Chapter, social behaviour is indicative of self-awareness. [Actually, anti-social behaviour is probably even more indicative of self-awareness.] Male chimpanzees for example kill monkeys for ‘fun’, and have casual sex for ‘fun’ (and not for reproductive purposes). It has also been reported that the famous chimpanzee ‘Washoe’, who was taught sign language from birth, was asked while looking at herself in a mirror: “*Who is that?*”, responded without hesitation: “*Me, Washoe*” (Gardner and Gardner 1969, Kuhse and Singer 1985). Presumably Washoe was referring to her image in the mirror when she responded. If so, this is very suggestive that Washoe has self-consciousness.

It is extremely difficult to decide whether other animals have the same level of awareness as humans do, because we tend to imagine that other creatures think or behave like us in some ways. We even imagine at times that a plant has a mind of its own, in the way that it grows towards the sunlight, but this is just a simple chemical reaction. On the other side of the coin, many humans believe that we are different from everything else, that we are special, that we are designed by God and have a destiny, and that we are the only creatures who are truly conscious and self-conscious. Once again, the only way to decide these issues is to design ingenious experiments, which objectively address these issues, but this is difficult because we are studying subjectivity, and animal subjectivity at that.

On a more philosophical level, if the ‘self’ is a model of ourselves in relation to the world around us, and if other mammals have consciousness, which they probably do, then in order for them to also have self-consciousness, all that would be required is that they have a model of themselves in relation to their primitive form of consciousness. Animal self-consciousness may then exist in a different form to our own, using those concepts of perception which are available to the animal. The ‘self’ in animals, if it exists, may not involve language as it does in humans.

#### **4.14 Are babies conscious?**

Babies may have consciousness since they show characteristic facial expressions reminiscent of adult emotions, but they are certainly not as conscious as adults. Comparative studies suggest however, that children around the age of two years have superior mental capabilities compared with other adult mammals like the chimpanzee. By this age many children even have language and imitation abilities

It is interesting to observe how young children react to each other, as this may tell us something about whether they have self-consciousness. Have you ever observed how two young children, aged around two or three years, look at each other as they pass

by in strollers (upright prams). They turn their heads right around to keep an eye on each other, often well after they have passed by. Babies also cry if they see or hear another baby cry. It makes you think they may have already developed some form of self-consciousness, as it appears they appreciate their position in that they empathize with the other child.

We believe that human babies, and most other mammals, do not have full self-awareness, as this seems to require knowledge and language in order to be able to properly assess oneself, and to make plans. Self-consciousness in a child does not really reach maturity until early adulthood, and even then some children still do not really understand themselves or how they fit into society properly. [Teenage suicides may be a reflection of this.] We also believe that human interaction may be of vital importance to the development of full self-awareness or the sense of 'self' in a child. From early childhood we set about installing the belief of a 'self' in children by asking them leading questions which directly refer to themselves, which identify a 'self', such as "What did YOU think you were doing" or "Is Mary happy?" (pointing at the girl while asking this question). These sorts of questions, either directly identify a 'self' or they imply a relationship between the child and other humans, which develop notions of what it is like to be someone else. If this concept, that the 'self' is developed through human interaction is valid, then someone who has lived in complete isolation may well not have self-consciousness. This would be difficult to test however, because that individual would not have language so we would not be able to properly communicate with him.

By the same token, if we raised animals with intimate human interaction, and developed some form of language system to communicate with them, (like the chimpanzee 'Washoe', who was taught a type of sign language) one can ask whether we would be contributing to the development of self-consciousness in these animals. Many pet owners are absolutely convinced that their pets have self-awareness, but as noted earlier, we do not know how much we imagine something like this to be true. Pet owners usually develop a primitive language system that enables them to communicate with their pets. One wonders if this phenomenon may have contributed to John Lilly's belief that his dolphins had self-consciousness, whereas other experiments, with mirrors and spots, using unfamiliar dolphins, suggest that dolphins generally do not have self-consciousness.

#### 4.15 'Free will'

Experiments by Ben Libet and co-workers suggest that volitional consciousness seems to follow a few tenths of a second after a 'readiness potential' has already been identified, by an electroencephalograph, in the forebrain of the experimental subjects (Blackmore 1989; Dennett 1991; Libet, Wright, Feinstein and Pearl 1979; Libet 1981, 1985). In one experiment (See Figure 4.3), the subject was asked to flex her wrist when she felt like doing so, and to simultaneously record that moment, when she had

‘decided’ to flex her wrist, by using a rapidly revolving disc with a spot on it (that is a type of clock) which was placed in front of her. Meanwhile Libet was recording the readiness potential. Analysing the results later, Libet found that the readiness potential, occurred about three tenths of a second before the subject decided to carry out the volitional act of flexing her wrist. The physical act of actually moving the hand followed about two tenths of a second after the subject decided to move it, or just over half a second after the readiness potential was observed. These results seem to imply that Libet can predict that the subject will flex her wrist, about three tenths of a second before the subject has consciously decided to flex her wrist, although Libet does point out that the subject still has an opportunity in the last tenth of a second or so to veto her action. Theoretically we should however be able to find some other part in the brain, where the vetoing decision is being made, and we should then be able to determine, once again before the subject knows, if they are going to veto their decision or not. If this view is correct, there is no ‘free will’. Just imagine for a moment that you were asked to press an imaginary button in front of you, and somehow someone could predict when you would actually do it, just before you decided to do it, and not be fooled by your ‘almost would’ times. That is what seems to be implied by these results, although there is some controversy about their interpretation.

**[insert Figure 4.3 about here]**

In another set of experiments conducted in the 1960’s, W. Grey Walter asked subjects to press a button in front of them to advance a slide carousel, but unbeknown to them the button was really a fake. Grey Walter would instead advance the slides himself by monitoring the motor cortex of the subjects with electrodes. What was particularly interesting about these experiments was the subjects reported that they thought the slides were advancing just before they had actually decided to push the button, as if the slide projector was anticipating their decisions (Dennett 1991; Grey Walter 1963). Some subjects reported, as a result of this sensation, that they often felt as if they may have accidentally double pressed the button, which would have advanced the carousel by two slides.

These experiments suggest that neural processing for a voluntary action may have already begun well before the subject has consciously ‘decided’ to act. They also seem to suggest that there is no ‘free will’, certainly not in the context that ‘we’ generally imagine it exists. It would seem that our actions might have been determined before we actually thought we had decided to do something. Strange as these results may seem, they are consistent with logic and our general attractor ideas, since consciousness follows attractors and the processes that ultimately lead to those attractors.

Libet’s experiments do not necessarily mean that we are complete Zombies (creatures without minds), as we at least have some knowledge of what is going on, and what has happened, even if we do not completely determine what to do, and even if we do

not have the power to veto a decision. This does not mean that we should not be held responsible for our actions. If we commit a crime for example, we could always blame the neurons in the forebrain that instigated this voluntary act, or the readiness potential. It is difficult to separate these neurons from the rest of us, so why not punish the person anyhow. We have the ability to change our behaviour in future, if it was deemed to be inappropriate, by learning from our mistakes. We simply store in our memory the fact that this behaviour was wrong, and we should not do it again in future. This stored memory will then influence our future behaviour so the inappropriate action is not repeated and our behaviour is socially acceptable. This is the way memory and neural processing works in the brain. Our future decisions are determined by our past decisions and attractors, which are now encoded into the synaptic efficacies. In fact, this is probably how we attempt to rehabilitate criminals back into society by using punishment, threats and re-education to correct their inappropriate associations between behaviour and morality. Animals also display this type of learning, which is called instrumental conditioning. Animals learn to make associations between the correct response and reward, and the incorrect response and punishment.

On the question of veto, from personal experience (which may be misguided), we seem to have the ability to reject, or veto, absurd notions or morally inappropriate ideas that surface in our mind or consciousness, before they are instigated. *“And if my thought-dreams could be seen, they’d probably put my head in a guillotine”*, to quote Bob Dylan from *“It’s alright Ma, I’m only bleeding”* (Special Rider Music, 1964). At times, we all fantasize about something which may be quite deplorable. For some reason, we do not act out these eccentric thoughts. It seems as if we may have some freedom in choosing from a number of the brain’s responses, even though we may not be responsible for the initiation of those responses. Libet suggests that we have around a tenth of a second to ‘veto’ something if we want to, however many scientists are in disagreement with this interpretation of Libet’s experiments and suggest that the power of veto itself may also be an illusion. What may be happening is that our brain has already made the decision to veto, or not, and the ‘self’ imagines that somehow it made the decision to choose from one of the alternatives, whereas the decision had already been made before it entered consciousness.

The legal fraternity has long recognised that there is ‘free will’ of some sort. In a court of law, it is necessary to determine whether the accused (assuming he is guilty) acted intentionally (with ‘free will’) or if he is remorseful and will be unlikely re-offend. The law is generally lenient on those who made an honest mistake, who did not wilfully intend to harm to others. Another interesting point about the law, is that it seems to directly recognise the existence of a ‘self’, as one can sue others who have upset or hurt them (their ‘self’) emotionally, or even in the eyes of others (liable and slander). The law also recognises that one cannot be held responsible for ones actions if one has a mental illness (or a dysfunctional ‘self’), if one has acted out of character by extreme provocation, or sometimes, if one was influenced by drugs.

Note that 'free will' is also synonymous with the existence of a 'self', or a homunculus, or central controller, who is making decisions for us based on our previous experiences. It should then be no surprise that we may not have 'free will'.

As we noted earlier, if our decisions are based on attractors, which seems to be the most logical alternative, then we cannot escape the conclusion that there is no 'free will' in a physical machine. This is because whatever caused that decision, or attractor, must have been started by something. In physics this is called 'causality'. The brain is a complicated device, which processes and integrates information obtained through its senses, arrives at decisions based on previously acquired information, and then generally instigates a response (which could involve learning) or motor action based on this stimulus. This process largely proceeds without any supervision. There is really no room for 'free will' in such a system. 'Free will' and 'choice' are social issues and have no place in a physical machine such as the brain (Hopfield 1994). This may be one of the reasons why we are finding it so difficult to understand self-consciousness and 'free will'. They do not really exist, but are phantoms of the mind. Somehow the brain makes 'us' feel that we are making the decisions, whereas they have already been made. This does not however mean that there is no consciousness, as we are still confronted with explaining how memory features are bound together and why our attention is a serial process. There may still be room for a form of self-consciousness that corresponds to having a model of oneself in their model of the rest of the world.

Another attribute of self-consciousness which is closely associated with 'free will' is so called 'willpower', which we are presumed to use when we stop ourselves from doing something, such as avoiding sweets and delicious chocolates for the sake of our diet, or giving up smoking (nicotine addiction) or other drugs. If we remain committed to our notion that there is no 'free will' then this struggle could manifest itself as a conflict between would-be attractors in the unconscious mind, each vying for attention and decision making consciousness. For example, do the attractors associated with giving up smoking (which may be associated with revulsion and bad health) win out over the attractors associated with the pleasures of smoking? On the question of drug addiction more generally (including alcohol), one may speculate that when we take drugs they leave traces in our brain associated with their pleasurable use. When these memory traces are reinitiated later, with their associated pleasures, this may urge us to take those drugs again. A similar phenomenon may occur with other addictions such as those associated with sex and pornography, eating and dieting, and even with committing crime itself (with its associated adrenaline rush). It is interesting to note that, in view of these re-surfacing urges, the law sometimes views drug addiction as an illness instead of as a crime. Some social workers argue that these principles should be applied to other crimes as well, which is tantamount to suggesting that we are not really in control of ourselves.

Following Penfield, who observed that conscious awareness can follow after electrical stimulation of the temporal lobes, Libet et al have demonstrated that

conscious awareness also develops if the ventrobasal complex in the thalamus (which carries somatosensory information, relating to touch and pain, to the cortex) is electrically stimulated for a sufficient period of time. Libet's subjects were patients who had electrodes inserted into their thalamus to attempt to control chronic pain. What was particularly interesting about their results was that this stimulation had to proceed for of the order of half a second or so before awareness, or what they call "neural adequacy", develops (Libet et al 1991). Libet et al also noticed that if the stimulation was not of a sufficiently long enough period to generate conscious awareness, the subject could still correctly 'guess' if they had been stimulated. This situation is analogous to the 'blindsight' phenomenon.

If the brain is essentially an autonomous device without any real control, then it functions and makes 'new' decisions based chiefly on input it receives from the environment, and of course generates itself through its program of spurious memories. This is why for instance counselling works. What a counsellor does is implant positive thoughts into your brain, which in effect change your behavior. This can be effective even if the subject is not consciously absorbing what they are being told. Remember, we are only conscious of a small part of what the brain is doing. Such thoughts and ideas may well be circulating in the subconscious brain and may eventually surface into the conscious, where the patient can now feel better. What the counsellor has done is seed the idea. This phenomenon also explains for example why advertising works. We could be absorbing information subconsciously which will eventually process into the conscious mind and act upon it by buying some of the advertised products. It is in essence a form of brain-conditioning as it were. Environmental stimulation and the interaction with others can also explain why we act and decide things as we do. All of the people we meet and encounter in our lives has an influence upon us in some way and change us in some way, however minute. We often, view chance encounters and coincidences as strange occurrences but what is really happening is that they are shaping our very lives. Indeed, if it was not for these continual interactions with other people and changes in the environment around us, we would be almost forever set in our ways. The fact that the brain can generate new creative states of mind is also allows us to develop new thoughts and change. Some of these spurious memories or thoughts can be assessed internally using available memory stores and beliefs, by it is the interaction with others and things around us that really shapes us into who we are.

#### 4.16 The 'self' revisited

Libet's results and the general paradoxes associated with the 'self' and 'free will', have lead many others to suggest that there is no 'self', that the 'self' is an illusion, which is invented by our brains to give us a story behind our actions (Blackmore 1999, Claxton 1994, Dennett 1991). Furthermore, this story is backdated so it looks as if the 'self' is in control and making decisions freely.

Claxton suggests that we fabricate stories when we cannot explain our actions. If we



are really conscious of what we are doing, then why is it that we say things like, “The Devil made me do it”, “I don’t know what came over me”, or “I don’t know what I must have been thinking about”. [I was sitting in a bar, editing this Chapter, when I saw two elderly gentlemen, who were normally the best of friends, lose it and start pushing and shouting abuse at each other. They were not intoxicated, as they had only just arrived in the bar a few minutes earlier. Suddenly they wanted to go outside and ‘sort’ each other out, which would have happened if the barman had not intervened. Later, after one of the gentlemen had left, the other looked very regretful about what had happened. The rage of the moment had obviously consumed these two gentlemen, and it made me wonder, if there really was a ‘self’, who was in control, and where were these ‘self’s when they both removed their glasses, preparing to fight in the alleyway.]

Blackmore has proposed an interesting theory of the ‘self’, which is based on the evolution of memes (Blackmore 1999). Memes are just ideas, beliefs, or things that we do, which we have copied from others (Blackmore 1999, Dawkins 1976, Dennett 1995). Memes are copied from person to person and under appropriate conditions can spread like wildfire. They supposedly evolve in much the same way as genes do. They have the three basic requirements for evolution. Memes can be copied or reproduced, they are varied as they are passed on to others (this is equivalent to mutation in biological evolution) and the best or fittest memes win over others. Just as biological evolution has led to an array of wonderful creatures, fantastically intertwined with each other, memetic evolution has resulted in the development of a complex human society, human culture, and technology. The Internet is arguably one of its evolutionary products that aids the spread of memes even more. Without going into too much detail, memetic evolution explains many of the strange things we do that do not seem to have a clear biological purpose. For example, why do we talk to each other so much, and why do we freely exchange ideas. This is strange, because we are supposed to be in competition with each other, each of us trying to propagate our own genes, so why would we help each other? Blackmore suggests that we do this to spread the memes of course, and this may also explain why we have such a large brain (to be able to imitate each other) and why we have developed language, again to spread the memes.

A collection of mutually supporting memes, called a ‘memeplex’, can facilitate their mutual informatic survival, just as a collection of genes or organisms can support their biological or genetic survival. Blackmore suggests that the ‘self’ is just a special type of memeplex, a collection of memes, memories, ideas and beliefs, which she calls a ‘selfplex’, which will defend and propagate its own memes. For example, the statement “I believe that the death penalty should be abolished”, carries so much more weight with the use of the pronoun ‘I’, that is, it is backed up by the ‘self’ who firmly believes what it is saying. In Blackmore’s theory, the ‘self’ is an illusion, which is generated by the memes, designed for their own purpose, for the evolution of memes. One of the problems with this idea is that, if everyone is defending their own memes, and if, as Blackmore asserts, memes are competing for the limited

storage space in our brains, then what overall benefit is there to the memes themselves. The available mental space for their storage may be constant, but what this process does is generate competition between memes, so as to benefit the betterment of memes through this competition (Justin Freeman, private communication).

**[insert Figure 4.4 (photo of Susan Blackmore) about here]**

If Blackmore is correct, and Libet's results are interpreted to mean there is no 'free will', then we are just machines, which react to stimuli in accordance with our previous experience (and continue to learn our new derived attractors), but with the added twist that much of what we do is for the benefit of memes, that is, to seek and spread information. [Maybe that is why 'I' am writing this book.] This would explain why for example we do things for others, beyond normal altruistic (or, a favour for a favour in return) tendencies, why we also put our careers ahead of our families. The human brain is extremely well equipped to copy and imitate from others, facilitating the spread of memes, which may be why we invented language. Blackmore refers to us as 'meme machines', as she suggests that one of our main functions in life is to receive and transmit memes. Note that humanity has essentially halted genetic evolution (we help the sick and frail survive) and is on the verge of actually manipulating genes for its own purposes.

We believe that memes may also play an important role in the origins and the development of the 'self', particularly in childhood as was discussed previously. We seem to go around asking young children about themselves, THEIR inner thoughts, who THEY are, what THEY want to be when they grow up. In this way we build up the mental imagery of a 'self' inside our children's minds, and this is how we develop a sense of what belongs to us, such as our bodies and our possessions as adults, and what we believe in. Installing a 'self' in children is especially useful to memes because children have greater capacity than adults to acquire new information and memes. Their brains have not been filled yet, while ours has and is more stagnant. To put it another way, "You can't teach an old dog new tricks". Children have a greater capacity to influence others, and to spread their memes (and our memes) to others. This is perhaps what makes teaching so rewarding. There are, of course, other benefits for installing a 'self' in our children as it gives them a social understanding and certain neurological abilities, which can also provide a biological advantage. We may, for example, want to tell our kids about the 'self' so that they grow up to be responsible adults in an altruistic society. This then raises the question, as to whether families who have a history of crime, may have not passed on the proper notion of a social 'self' to their children.

If the 'self' is really just an illusion, we would need to reconsider some of the aspects of self-consciousness, which we discussed previously, namely directed recall, thinking and positive thinking. It may well be that things just happen automatically, as it were, in that cues appear in the brain because the brain (not the conscious 'self')

saw a 'need' (by which we mean that it just stumbled onto that path because of previous processing) to find out someone's name, or to solve some problem, and that all we are doing is making up a story of what we think we are doing, and backdating it to make us think that we have decided to carry out these actions. With respect to positive thinking (if it is really true) there may just be certain people with internal drive, which they have acquired from their upbringing and life experiences (or memes), which drives them to improve, to not accept an unfavourable decision. These people are then more likely to think positively and to help themselves.

If the 'self' in humans is an illusion, we may also need to re-examine what we think about animal consciousness and self-consciousness. If there is no controlling 'self' and we are just reacting according to our memories, then one must contemplate that we may not be so different to other animals, and if we have an illusion of 'self', then other animals may also have such an illusion. As pointed out earlier, the 'self' in animals may just correspond to their own model of themselves in relation to the world that they perceive. It seems reasonable to think that other animals may gain an advantage by being able to do this. One of the attributes of 'self' is that we proclaim a territory or a set of belongings. It is interesting to note that many other animals often display this sort of behaviour, especially when it comes to sexual partners and to territory. It is of interest to note however that animals generally do not copy and imitate each other to the extent that humans do, and so, if memes are responsible for the 'self' then, the 'self' in animals is not expected to be as powerful and prevailing as it seems to be in humans.

On a more philosophical note, if the 'self' and perhaps also consciousness are just illusions, we may want to re-examine the question as to whether plants and physical (non-living) objects may also have consciousness. We often look at plants growing towards the Sun and implicitly comment that the plants are trying to get to the sunlight, a statement that implies that they are intentionally doing this. Their actions are however just a chemical reaction or process, but the same can be said about the way the brain responds, it is just that the brain is somewhat faster. Maybe the key difference is memory, which is unique to us and other animals. From a purer philosophical perspective, to which we do not subscribe, it has been argued, that a table or a chair also has consciousness, as there is an underlying physical experience to what it would be like to be a table or a chair.

Blackmore's theory is interesting because, according to Blackmore, language also evolved for the benefit of memes and their proliferation, and humans seem to be the only mammals that have an extensive language system and self-consciousness. We saw earlier that there is another intimate link between language and self-consciousness, as we often talk to ourselves, and we need a verbal description of what is going on to describe the events around us to ourselves, or as it were to make up a story for the 'self'. Language was also important for consciousness in the split-brain patient experiments.

Whether or not a ‘self’ really exists, or if it is just an illusion that we have created in our heads, consciousness and the ‘self’ can still serve important functions to the individual, and if everyone else believes in a ‘self’ then it can make sense to also believe in it. Just because it is difficult to identify the physical origins or basis of a ‘self’ in the brain, does not preclude the fact that it may be useful.

#### **4.17 On the function of consciousness and self-consciousness**

Consciousness helps us to experience the world first hand. It gives it a sense of realism. There are good reasons to believe that other animals, particularly mammals, have some graded form of consciousness. It would give them, as it does us, a richer experience and perception of their environment, which one would imagine, gives them a survival advantage. Animals (ourselves included) may be further advantaged if we had a mental model of ourselves in relation to the world around us, or that is, possess self-consciousness. As noted earlier, the concept of a ‘self’ in animals does not have to be the same as the ‘self’ in humans.

The situation is slightly muddled by the fact that some of the attributes of consciousness, such as self-consciousness, can be more of a hindrance than a benefit. We saw earlier how some declarative memories, to begin with, such as riding a bicycle, later developed into non-declarative or implicit memories after some practice and experience. Once these memories have developed into automated memories it is best not to think about them whilst we are performing them. Thinking about them, or bringing them into consciousness, can be quite detrimental to our ability to carry them out. It is almost as if the neural processing is improved and sped up by allowing it to go ‘off-line’, or not have to enter consciousness. The occasional diversion of attention to this task every few seconds or so (for very brief periods), seems to be sufficient to maintain these types of memories or brain functions. We suggested earlier that self-consciousness gets in the way of multi-tasking, and ‘flow’, which is a state of profound focus, does better without a hindering ‘self’. If consciousness and self-consciousness slow things down, then why do we need them? It looks like they only get in the way for faster processing. We suggest that we may need to slow things down when we first encounter them, so that learning can actually take place. This may be one of the important reasons for consciousness.

Another important property of consciousness is that it is largely a serial process that can have implications for learning, as it prevents us from getting things confused. This reduces the risk of forming too many unauthentic associations between memories and between learning and actions. Serialization is useful as it gives us the ability to focus our attention onto a single aspect of the incoming information, such as an approaching dangerous predator in our visual field, or a single sound for example. The serialization of consciousness helps avoid confusion generally. Just imagine what it would be like if we were simultaneously conscious of everything going on around us and in our head. Serialization helps us deal with things in an orderly

manner.

The human brain seems to be affiliated with the concept of a 'self, although many scientists and philosophers believe the 'self is just an illusion, or an internal mental model. It is rather strange that humans have such large brains, compared to other animals, and the capacity to communicate so freely and diversely to each other (language). We may be the only creatures with genuine self-consciousness. One of the reasons why this may be so, is that we need self-consciousness to live with each other, to understand each other, to live in a complex society that has evolved as a result of the evolution of memes. Blackmore suggests that the 'self' has arisen from the evolution of memes, and that its function may be closely linked with the spread and development of memes. We pointed out earlier how the existence of a 'self' can be particularly important in this regard, especially when it comes to the development of a 'self' in children.

Whether or not the 'self' is a mental construct, it can still be useful. With self-consciousness we can (or at least we think we can, and this could be useful in itself); plan our lives, rehearse scenarios in our heads (without the dangers of actually doing them), predict what might happen if we take a certain course of action, reason, think, organize ourselves, motivate ourselves, desire, 'dream', learn or seek to learn what we want to learn, lie or deceive others (and subsequently also judge and learn to trust others), recall memories by placing cues in our mind, re-direct our attention, understand our evolution and change it, understand others and human society, understand Nature, science and abstract things (such as mathematics), understand the human body, the human brain, and (maybe one day) understand the human mind.

It is possible that the emergence of a 'self', may now itself influence the evolution of memes in the same way that the emergence of memes started to influence the biological evolution of the human brain. Excuse the pun, but the 'self' may have developed a mind of its own, and now 'informallogical' evolution (or the evolution of information) may be controlled by humans. We will suggest in Chapter 5, that human creativity plays an important role in the process of memetic evolution.

### Consciousness in a modern world

Humans are so much more mentally challenged today. I would suggest that this makes them more conscious than ever before. In the beginning of humanity we had simple lives, even if we had a large brain. Our abilities to think and deal with complicated and subtle memetic and psychological issues were not required, but this is not true today. Our life experience have the greatest influence on our state of consciousness and self-consciousness. We have already suggested earlier that the self is a function of our interaction with others. This ties in nicely with the fact that

although the basic structure of the brain is genetically determined, most of the actual wiring takes place as we experience. What I am suggesting here is that as we have to deal with more profound ideas, this has opened up a whole new level of consciousness.

there are also levels of awareness across the human race. Some people are extremely aware of what is going on, while others are more robotic in nature. This may be construed as a broad definition of intelligence and I would suggest that it is closely linked in with spurious memories or the ability to be creative as well. This is because this is the way that thinking and reflection take place. Of course, from what we have said earlier, creativity is itself also closely linked with knowledge as well. The point is that you would hardly perceive some situation if you had no experience about it and you would hardly come up with a deep thought about your surroundings and other people if you did not utilize your spurious memories. This level of awareness can extend over many fronts, be it social, technical, spiritual or even physical (this is important when it comes to sport).

### **Further reading**

“The Astonishing Hypothesis: The Scientific Search for the Soul”, by Francis Crick, Charles Scribner's Sons, New York, 1994. For many years consciousness was considered to be a taboo subject, that only one who wanted to ruin his career would think about. Francis Crick is a pioneer in the resurgence of interest in the neuroscience community into consciousness studies. This book focuses on the visual system, which is the best understood and most mapped neural pathway in the brain, Crick outlines what needs to be done to pinpoint consciousness in the brain.

“Consciousness”, by J. Allan Hobson, Scientific American Library, W.H. Freeman and Company, New York, 1998. Allan Hobson is a well-known neuroscientist who has made some important contributions to understanding what the brain may be doing during dream sleep. In this well written and well-illustrated book Hobson addresses the question of consciousness and suggests that the main aspects of consciousness may already be understood, something with which most people might not agree with. Hobson especially emphasises the important role the brain's neurochemistry plays in consciousness.

“The Meme Machine”, by Susan Blackmore, Oxford University Press, Oxford 1999. This book offers an excellent introduction to memes and the evolution of information. In this book Susan Blackmore suggests that the ‘self’ may be a ‘memplex’ (a collection of memes) that exists for the protected survival of its own memes. In this theory, the ‘self’ is an illusion. We have suggested that the existence of a ‘self’, and our desire to propagate this myth to children, could have beneficial effects for the evolution of memes. Susan Blackmore is currently writing a book on consciousness.



## 8. The role of self

### The function of self consciousness

Assuming that the self is real, there are a number of useful functions it serves. (##GET LIST FROM PREVIOUS CHAPTER \$ ON THE CONSCIOUS BRAIN ###).

Blackmore, Dennett and others have conjectured that memes play an integral role in the development of the human mind and in particular with the mysterious self. It is natural then that I should include a chapter on the conscious and self-conscious brain and try to make sense of these fascinating attributes of the human brain. I believe that, in addition to memes, spurious memories are also important in the development of the self. Spurious memories are what enable us to think, learn and to plan our lives. Most scientists nowadays think that the self is an illusion, that it may just be a mental model of ourselves in relation to the world around us, and that there is really no free will. Our conception that we are controlling our every movements and thoughts is an afterthought generated by the brain that maps our decisions back in time to give us the illusion that we are determining our actions. Scientific evidence suggests that the brain has already started off the decision to perform some action a few tenths of a second before we consciously think we have decided to act. If this is indeed true, and it appears to be the only way to get over the dilemma of self, one may ask, why has a self evolved, what is its purpose and why do we help to perpetuate this illusion, especially to our children. Blackmore suggests that the self may have evolved because it works to protect and transmit memes and beliefs. I have suggested that we may develop the illusion of a self in our children because this also gives us the opportunity to pass on our own memes to our children, who will then protect and transmit them to others. In this case, our children carry our memes as well as our genes.

Each of our human minds is an evolving system in itself, so one could also ask if this evolution is somehow driven by the selfish self to coin the phrase of the selfish gene and selfiswhether there be a selfish self, in the same sense that there is a selfish gene and a selfish meme. We obviously do things for our genes (family), our memes (career) and sometimes just for ourselves (like private things). REWORD THIS PARA

we have empathy for other animals: we care for cats and dogs fro example, we try to save animals in danger of extinction, we have laws protecting native animals, and I just heard a case about a bikie who was charged wth threatening to kill a police sniffer dog. we may do these things because we understand th need to maintain genetic diversity, but as most people do not believe in evolution (by the creator, God) I would be inclined to suggest that we care for animals because we feel that they too may have a consciousness and self-consciousness similar to our own. I suggest that this may be so because we generally do not hold the same empathy for insects and plants, although we do show some regard to certain plants, especially large trees, which have existed for hundreds to thousands of years.

If free-will is an illusion, and the self is just a memeplex of ideas and beliefs, as suggested by Blackmore, why do we really need it, that is why do we really have to be conscious, or self-conscious. Why can the memes not just compete for the attentional space in our heads without us knowing what is going on, and imagining that we do.



## Master or slave

According to Blackmore, and the scientific evidence in relation to the self and free will, we are just memplexes, acting like automaton according to our previous experiences, which includes our memes and innate behaviors. Occasionally however we make novel decisions, based on based on spurious memories. One wonders if these spurious memories are hence related in some way to our free will and self-conscious feeling, even if they are illusions. In this case the memories are the memplex and the spurious memories help to bound them into a conscious experience.

Another interesting point to consider is that a lot of the phenomenon that we are trying to describe or explain in terms of memes could also be explained if we granted the fact that there really is a consciousness and self-consciousness, and it is not an illusion. One could then argue that we control the memes and that we also do many of the weird, biologically inexplicable, things that we do, for the human race and society.

This is where the self also comes into the picture. One has to wonder why we are probably one of the only animals that has not just consciousness, but also reflective consciousness, or what is also called self-consciousness, which is the ability to recognize that we are actually conscious and we also have the ability to plan and re-organize what we want to do and think about. This is a remarkable property that we have and there is no firm evidence that any other mammals have this ability. It could also be another feature of humans that distinguishes us from other animals, just as our large brain does. The question I would like to raise here is: Are the two related through memes? That is, is self-consciousness and the 'self' related to our quest for information and memes. This may well be, because one of the benefits of the self is so that the organism can not only observe itself, but also its relation to others, or the social environment. We would suggest that the self is important and as a reward mechanism. We also feel good if someone gives us a 'pat on the back' to speak. In fact making the self feel good is our primary short-term objective, and we need such encouragement to continue to pursue our goals and ambitions. The self is also important for thinking, which raises the question if the self is also related to spurious memories which are surely linked with the thinking process.

The other possibility is that even if we assume Blackmore's premise that memes and/or genes have given us our self-consciousness and will that now that we do have these attributes we are able to utilize them choose what memes we want to propagate. For this point of view to hold water we should be able to argue that self-consciousness, even if it evolved because of memes, serves some important biological function. Self-consciousness gives us a sense of how we fit into this complex world, and clearly such knowledge would give us a survival advantage, because we can use it to decide what actions are appropriate or inappropriate. Self-consciousness or knowledge about ourselves also gives us an understanding of how other people like ourselves feel, so we would then act in ways that were socially acceptable. The existence of a self gives us our personality and enables us to investigate ourselves and others, our genes and our memes.

There are other things that we need to copy from others, not just how to use tools, or how to deal, fix or do things, what facial expressions to use, when, how to talk, walk, etc. there are so many things that we need to copy. We also copy the belief in the 'self'. We talk to our kids with the 'you' pronoun, until it becomes inbred in them that they have an "I" in them. We even tell each other what color is red. We basically define red as the color that everyone else calls red. This is qualia.

So, we have argued that qualia and self consciousness are meme generated. The other forms of consciousness, for example, emotion, pain are innate and not passed on.

However as mentioned previously even if 'self' consciousness is meme generated, it can still have a life of its own, and make decisions based on its own fitness/ happiness function.

The 'self' also gives us a sense of personality and we can use our 'self' to further our own course, for the benefit of ourselves and our families, or our genes. Even if the 'self' may have developed for the benefit of the genes and the memes, one can ask if there it can now exist and evolve for its own purposes. It would really make a best seller with a title like "The selfish gene, the selfish meme, and the selfish self". Blackmore suggests that we are slaves to memes, but if we can chose which memes to keep and which to reject (based on our life experiences), whether or not a self really exists, then memes are also slaves to us. Human society as a whole also determines collectively which memes survive. A meme enthusiast may argue that memes control our minds, and the 'self' which they have generated, is the way that this system feeds back into itself, that is the 'self's influence the memes, or act as a fitness function in their evolution, if you like. What is important here is that some things are decided by humanity as a whole and one needs to then understand emergent behaviour that may arise from the interaction of many people, just as we have been concerned here with trying to understand how this can happen with a bunch of neurons.

### Spurious memories

if we are just memplexes or a collection of ideas and memories that we have created over our lifetime and we just act according to whatever comes our way, then there would seem to be no individuality at all, absolutely none. This is not quite true, as we have all endured a different life experinece, so we are different and would (re)act differently. I believe that the true key to our individuality are our spurious memories. they are made up of combinations of our stored memories and experiences. Spurious memories are generated in our brain naturally, as explained before, and they generally consist of combinations of the memories that are stored in there. Our brain, which is our memories then select from these spurious memories and this is our individuality, how we plan our actions, but by the same reasoning as before, they too arise in the brain before we become aware of them so there is still no self with the fee will we usually imagine there to be.

### The selfish self

If consciousness, and self-consciousness in particular, are just illusions then why do we have it? Why could we not just go around doing things without any consciousness at all? Why could the brain not just act without us knowing what is going on? Maybe there is more to the existence of consciousness and the self than what is suggested by Blackmore's meme theory. There are many things which we do that have a biological reason, and many things that we do that have a memetic reason, and many things that have both a biological and a memetic reason, but there are also many things that we do that seem to be for the self. Even if the self evolved for the purposes of memes of genes or both there seems to be as it were a selfish self as well.

One has to wonder why we are probably one of the only animals that has not just consciousness, but also reflective consciousness, or what is aslo called self-consciousness, which is the ability to

recognise that we are actually conscious and we also have the ability to plan and re-organise what we want to do and think about. This is a remarkable property that we have and there is no firm evidence that any other mammals have this ability. It could also be another feature of humans that distinguishes us from other animals, just as our large brain does. The question I would like to raise here is: Are the two related through memes? That is, is self-consciousness and the 'self' related to our quest for information and memes. This may well be, because one of the benefits of the self is so that the organism can not only observe itself, but also its relation to others, or the social environment. We would suggest that the self is important and as a reward mechanism. We also feel good if someone gives us a 'pat on the back' to speak. In fact making the self feel good is our primary short-term objective, and we need such encouragement to continue to pursue our goals and ambitions. The self is also important for thinking, which in turn may tie the self in with the spurious memories we were talking about earlier.

Why do we donate money to charities anyhow? Why do we want to help others? What biological reason is there for us to help others. One explanation may be so that people notice us when we do donate money, so that we will be popular and people will want to know about our memes. But some people donate money anonymously, why would they do that? If they are the only people who know about it, this suggests that they are doing it for themselves only, maybe they feel guilty or compassionate for some reason. They are doing it for themselves, for the self, which adds weight to the notion of the selfish self.

Another thing that we do that does not seem to have either a biological or a memetic reason is smoke tobacco. We do not smoke for either of these reasons. Smoking harms our health and even knowledge of this does not stop us from smoking. Although many of us smoke because other people do and we are tricked into it by clever advertising, we smoke because we become addicted to nicotine, because of a neural or biochemical process in our brain.

If we are just a collection of memes, each of us evolved from our own personal experiences with the world around us, each our own collection of memes, ideas and beliefs, then a corollary of this is that we are only who the society around us has allowed to be. In other words, people become who others allow them to be. This is also one of the reasons why creativity is so rare amongst most humans. Most people are prepared to just copy others and be like others, not venturing out of an arena determined for them by society.

Note, even if the 'self' is meme generated, it can still have a life of its own, and make decisions based on its own fitness/ happiness function. The same is actually also true if the self is an illusion.

We have explained in this book how it is that genes and memes evolve in a similar way, by producing copies of themselves, mutating and by selection. This however is not the only method for systems to evolve. The physical universe evolves in a completely different way. After the Big-Bang new elements were synthesized under the laws of physics (utilizing mainly the strong and electromagnetic forces), and then stars were formed as particles attracted each other through the gravitational force. All these stars are now evolving as they burn their fuel and slowly change from one form into another. Even the Earth is evolving, with its mountains and coastlines being eroded.

Another system that evolves in a different way to genes and memes is the human brain itself, and it

turns out that there are a few different ways in which this takes place. Firstly, when we are born, most of the brain is unwired, and new connections are made in what appears to be a semi-random manner, later to be pruned to keep only those connections which are useful and eliminating those connections which are not required. In this way the brain evolves itself into an efficient processing machine that helps us survive in the world around us. This pruning and growth evolution is mainly used in the early development of the brain and most of it is associated with developing biologically important features such as vision. The most rapid period of growth in synaptic connections occurs during the first two years (termed the critical period) where the brain makes a staggering one million synaptic connections per second. This is followed by slower periods of synaptic growth from the ages of two to seven and then from seven up to about fourteen years. After this there is much less synaptic growth in the brain. There is however another way in which the brain evolves and adapts, and this relates to spurious memories. As we have mentioned before spurious memories are memories that are generated by the brain itself, as a result of the distributed overlapping storage of memories in the brain. Quite unlike a computer, memories in the brain are stored in common areas, sharing neurons and synapses. These spurious memories, which have been observed in mathematical models, generally consist of combinations of features of the stored memories. In 'Memory and Dreams' we have suggested that spurious memories are indeed how the brain generates new ideas (creativity), how it is able to adapt to new situations as they arise, and how autonomous (unsupervised) learning takes place. In this picture the brain goes around learning (or enhancing) its own spurious memories. This is consistent with the fact that we can only learn something if we know something about it in the first place. You could hardly appreciate or learn something about quantum mechanics if you knew nothing about physics say. This is also a profound statement in itself because it asserts that whatever you learn is in a sense already in your head and all that you are doing is enhancing those spurious memories which are required in your new experiences. In this way the brain is itself evolving according to the spurious memories it utilizes. These spurious memories are also how we think and plan our lives, so they are an integral part of our self and how we act. They are that part of the self which decides how we should act.

When we do things we have the distinctive feeling that we are choosing these actions, but as we have seen this is an illusion, as we have no free-will. It also does not make sense that we act without something making us do so. Something deep in the brain (I suggest spurious memories) instigate our actions before we are aware that we have decided to do them. It does not make sense that we should consciously decide what we are about to do, because the question then is how did we decide this. What I believe happens is that a spurious memory surfaces in the brain that makes us act in a certain way, and our conscious awareness is just a reflection of us observing this state of the brain. The decision to act has already been set in motion to act before we think we have decided to do so.

Even if there is no real self, and no free-will, and that we are only conscious of our decisions after they have in a sense already been made, one can still argue that our brains is making these decisions based on its previous knowledge. In this sense the actions of the brain are performed for it's own 'selfish' needs, so we can speak of a selfish self as being that process where the brain makes such decisions for its own benefit, even if it is not directly tied in with the self itself.

Memetic emotions

Since most animals, particularly mammals, seem to have pain, one expects that most emotions in humans evolved for biological reasons, but this does not mean that

memetic evolution has not contributed additionally to their experience. The reason for this is that most of the brain is only hardwired from birth, and so one expects that some portion of emotions may have a memetic component to them, derived from the interaction with other human beings. Although most mammals would seem to have emotions like pleasure, pain, fear and grief (to a certain extent anyhow) it is unclear if they also experience some of the more sophisticated human emotions like regret, anxiety, psychological pain, depression, sadness, joy, pride, envy, embarrassment, disappointment, affection, anger and love. It is then not unreasonable to expect that since we may be the only mammals to have these emotions that they may have evolved through memetic evolution, or have developed during our life experiences through the interaction with others. Some of these emotions would appear to have developed in this way. How would we know about psychological pain and love if we did not have discussions with others. It would also appear that we experience emotions like love and grief much more intensity than other mammals.

It also stands to reason that these additional and strengthened emotions contribute to our sense of self, having already suggested that the self is really just a model of ourselves (body and mind) in relation to our model of the world around us, as they give us more information about ourselves. Also as we have suggested the self is also closely tied in with language and social interaction, so the reverse is also true, in that the existence of self in humans heightens our ability to perceive some of these emotions. We can talk to people about them, define them and read about them in books.

By the same token, one may also suggest that a considerable component of self-consciousness may also have developed through human interaction, which necessarily involves memes, particularly since we seem to be practically the only mammals to have self-consciousness, other than chimpanzees and the orangutan. Indeed this is what we have been suggesting in this chapter. Mind you if chimpanzees and orangutans have self-consciousness and no memes one would need to explain how it developed in them if they do not have memes themselves, although recent evidence seems to suggest that some copying does actually take place in these animals as well.

## 9. Criticisms of the meme theory

We review some of the extraordinary claims made recently by Susan Blackmore in relation to 'memes', or imitations that are transmitted between humans. We point out that some of the claims that memes can explain the origins of a large human brain, and the existence of language can be housed in a much less exuberant theory where information is seen as a means to increase one's chances of survival, without the need to propose that we are controlled by memes. Blackmore also ignores the profound contribution that is made through creativity, and competition and cooperation. But these are memes competing etc. Clearly the human brain/mind is capable of generating completely new memes, which may or may not be based on previously acquired memes. The brain is also capable of thinking, or combining memes and information in novel ways, and checking if these newly generated packets of information have any worth in that brain's model of itself and the world around it. Blackmore suggests that thinking, creativity, and our behaviour, in how we spread memes/ information, were developed in the brain to suit the memes themselves. We feel that creativity is naturally generated by the way that memory is stored in the brain, in a distributed and overlapping fashion. Memories generally share common neural activation states and as a consequence of this the brain generates so called spurious memories which generally consist of combinations, but not all, of the stored memories. Blackmore suggests that social behaviour and cooperation among humans is also meme driven, but there are also other forces at work that would appear to have a genetic origin. Ants, for example, along with many other 'social' insects, such as bees, wasps, and termites, and some groups of animals, such as chimpanzees and dolphins have complex societies. If these insects and animals do not exchange memes, as far as we know, at least to the extent that we do, then some of these social behaviours must have a genetic origin. Blackmore further suggests that everything is always evolving to get better and better, but this is not necessarily the case, as what may be better now, in some environment, is not necessarily better in an altered environment, which is constantly changing. This is perhaps the biggest weakness of the Blackmore theory, in that there is no well defined fitness or goodness function for memes, but the same is incidentally also of biological/ genetic evolution. It is difficult to explain even for a biological system what it means to say that other living organisms are evolving to improve themselves. What one normally means by this is that that creature fits in well with the surrounding environment, biological and physical. One also needs to consider the third law of thermodynamics in physics, which asserts that the entropy, or the number of allowed states of the Universe is actually increasing with time, which suggests that not everything is always improving in goodness, fitness or generating patterns or symmetry.

memes are not digital and there is no meme molecule like DNA. As DNA is the vehicle of genes, humans are the vehicle of memes.

As memes are also largely stored and tested in the human brain and hence the human brain also controls memes.

## 10. Memes in the modern world

We use memes in our everyday lives, the way we prepare food, the way we dress, and the way we act morally. And memes influence our very lives. Advertisements tell us which products we should buy, and laws tell us the way we should act. In addition to this our very occupation is a collection of memes and all our financial, political and legal systems are also just complicated conglomerations of memes.

### The male world

It is quite apparent that men seem to run the world. Why is this? as we noted earlier the memes that do best are those which have a biological link, like sex, aggression and feeding. I would suggest that aggression led society to evolve the way it is because we (subconsciously in the case of women) accept aggressive memes. We just evolved this way. It is true however that society is changing and our understanding of this injustice is slowly being reformed to alter this evolutionary status.

### The technological revolution

After the evolution of language, came other means for us to communicate, store and transmit information or memes. The advent of the Internet and the information superhighway is just what one might have expected to have evolved as a means to help memes to spread almost unabated. The Internet is a meme haven that make information readily available and allows ideas to be readily spread. If one wants to know for example how to grow and cultivate a certain crop, or something about a medical condition, like reflex sympathetic dystrophy, this information is readily available to the novice. The only problem with the Internet is that some of the available information is inaccurate, but memes do not really care about that, and inaccuracy can sometimes lead to new ideas. Most homes today have a computer connected to the Internet. Current estimates put the figure that there are 300 million webpages on the Internet. This has grown exponentially since the inception of the Internet. Just 5 years ago, the figure was 10 million and there is no reason to expect that this growth should not continue unabated.

It is amazing how quickly technology has moved along. Only 100 yaers ago we still pumped raw sewerage into our rivers and cities did not have any street lights. The evolution of information has changed the world dramatically. Our children have practically grown up with computers and the Internet.

On a 3.5 inch floppy disc we can store 1.44 megabytes (Mb) of information, which corresponds to roughly one book of a thousand pages, and this information is so easily accessible, with word searches. An ordinary compact disc (CD) can store about 640 Mb of information which is practically equivalent to an academics complete personal library. In the last 10 years or so, we have also seen the capacity of a computer hard-drive go from 10-20 Mb to about 10-20 gigabytes (Gb), which corresponds to 10,000 to 20,000 Mb. Then there is also the DVD (digital video disc or digital versatile disc), which can store about 15,000 Mb of information which is the equivalent of a

small town library. On top of this, one is also able to freely access information which is stored on such devices on hundreds of millions of other computers all over the world. Our ability to process and search through such information has also rapidly improved. Why is it that we need to store and process so much information.

In addition to books, computers and the internet we are able to transmit information to each other by using telephones (stationary and mobile), faxes, radios, newspapers, television (local and global/satellite/ internet), email, file transfer, and in addition to the written word we can use sounds and pictures (still and moving). Most households would have a radio, a television, a computers (or more than one), probably with internet access, a fixed-line telephone, a mobile telephone, a video recorder, a tape recorder, a record player and a CD players.

Because of the technological revolution, personal memes are far less important today than they were say a couple of hundred years ago, and maybe even compared to 10 to 20 years ago, because if you really want to know the answer to something you can generally find the answer to it, particular since the advent of the internet. There is always someone out there who is doing their part to spread the memes, without any selfish regard for their own gene pool, and the reason why this is so is because what they are really interested in propagating is their memes and not necessarily their genes. Remember that we are just a collection of memes and the scientific evidence is that we act in an almost robotic manner. Our belief that we are planning our actions seems to be an illusion.

Another reason why we have had a technological revolution is that our society, which was developed by the memes, has given us more leisure time to communicate, and we also encourage people to work to engage in this type of activity.

The Internet, and the availability of almost unlimited computing resources, has changed the way we manage such resources. Fifteen years ago my university use to have a computing center which housed two or three VAX computers which could compute at about one million operations per second. These computing resources were shared by most of the univeristies community, some two or three thoiusand staff. Nowadays most staff have a personal computer on their desks that have more computational power than these machines, and the computing center has, as it was, has become redundant. Today, to keep up with the avaiability of information through the Internet, the computing center has changed its role to one of managing information that comes into the university and calls itself IMS, which stands for Information Management Services.

The inevitable growth of available information has also lead to an increasing scientific interest in the science of information transfer and many universities around the world now have department which deal with information per se. The university of Edinburgh even has a Division of Informatics.

One may also argue that mobile phones were invented to aid the spread of memes. With mobile phones we are readily available to chat with people, nd chatting is something we like doing.

Why do we do science? Why do we need to understand the world around us, and why are we so determined to help the sick survive, as this interferes with biological evolution. The answer I would suggest lies with the fact that we are uncovering more useful memes (scientific discoveries are



generally useful), but one of the main reasons why some people want to be scientists is to become famous. If they become famous, they will be respected and other people will (want to) listen to them, which means they can spread their memes. Another reason we want to save and prolong the lives of sick people is because we realise the value of a life, a memplex that has evolved from an individual life-long experience. We also believe that other people has self-consciousness like ourselves and we empahthisis with them on what it may be like to have pain etc.

## Laws, politics and war

Laws have evolved in ever increasing complexity. There are all sorts of laws: criminal law, family law, business and corporate law, civil law, council (local government) law, national law, and even international law (as administered by the United Nations). In addition to all these numerous and complicated laws we have morals about how we are expected to act.

Laws are memes, or ideas that evolve, with the being kept and the flawed laws repealed. The evolutionary process, like in other systems, evolves slowly with changes made in conjunction with existing laws. In this way the evolution process is constrained so that changes are not too drastic.

By the same token that laws are memes, laws are also 'meme rules', which determine how memes are allowed to evolve, for example, laws are devised to restrict our thoughts (or new ideas).

Society has had a need to develop laws so that we all have a basic quality of life, and so that we can live in harmony and in peace, without fear. As noted earlier, in order to keep up with changes to society and new findings, laws get more complicated and evolve. This is because we discover new (generally statistical) correlations between what we do and the harm to others. Outlawing smoking in public places is a good example of this. Laws and rules reflect a balance of memes, and are mainly designed to protect people from physical (biological) and mental (memetic) harm. In many cases laws evolve as we discover something harmful that may affect other people, such as making in public places, driving our motor vehicles at high speeds, and allowing people to buy chemicals that can be used to make explosives. Some laws also have an adverse affect on our quality of life as well, since 'criminals' tend to find other ways to break the law. A classic example of this is taxation laws. Laws can also restrict our development in some ways. For example, not allowing children to experiment with chemistry sets has not enticed as many naturally talented youngsters into becoming interested in science.

The law protects genes, memes (which can also be laws and rules), and the self. An example of where is protects genes is in family law. When there is a marriage separation we have to pay maintenance for our children, and they are entitled to a share of our wealth when we die. The law protects memes too. We are allowed to have our own beliefs, like religious freedom, and ideas are protected as intellectual property and by patents. By the same token, the law also has rules about what type of information should be made readily available to others. Most countries have a Freedom of Information (FOI) Act which entitle people to know about information held about them.

Whether or not the self and free will are illusions the law recognizes that it does exist. People are punished for their actions, but the burning question in law is whether one

did the crime with intent, or with free will. this is discussed in other parts of the book. If the self does not exist one would have to say that the law protects memplexes.

If too many people do something that is detrimental to many others the law usually changes to outlaw this type of behavior. An example of this is the use of LSD in California in the 1950s and 1960s. In terms of the hydro-walking example mentioned earlier, if lots of people started to swap lanes like me, then it would become unworkable for lots of people to walk in the pool at the same time. A law or rule would need to be devised so that lane swapping was banned. The problem with this is that it affects a handful of people like me who were using this trick. I would now have to queue up behind people or go around them.

Rules in sport also change all of the time (that is, evolve) as they are adjusted to fit in with new information and in an effort to improve the game. Examples of these are that head high tackles in Australian Rules football are banned because they are dangerous, and a free kick is awarded to the opposing team if someone kicks the ball out of bounds on the full. It is also interesting how different sports have developed their own set of rules, each with their own names and nomenclature. For example in soccer we have a striker and a goalie, in rugby we have a hooker and a number eight who plays in the position with that name, in cricket we have a mid-on and a silly mid-on and slips, and in tennis we say 'love' instead of zero, after l'oeuvre, French for egg.

Laws not only change to protect our lives but also our memes. For example, is it against the law to discriminate against someone because of their religious beliefs. Also people sue each other if their pride, or reputation, is hurt or damaged by someone else. There are also laws to keep memes in check. We are not allowed to think freely about certain things; for example communism was outlawed after the second world war.

Laws and courts are required when two or more people, disagree or cannot get along with each other. What this means is that their memes (or personalities) clash. There are many aspects of the law. The number of laws are steadily increasing and in recent times more and more courts have been created to deal with more and more issues. For example, most countries now have special courts (or tribunals) for equal opportunity and sex discrimination, building practices, industrial relations, medical malpractice, insurance disputes and so on. More and more courts seem to be needed to deal with the ever increasing disputes that arise between people or memes, and they have developed for the benefit of memes to select the best. By this we mean the ones that fit in best with the rest of society.

Laws get more and more complicated. This is because the world is getting more and more complicated. AS more memes are discovered we need to make laws for them. After the advent of the Internet, laws had to be made to (still ongoing) to control copyright, pornography, hacking, illicit emails, and business for example. Also new

laws are constantly being made as new dangers to individuals and humanity are recognized. The only problem with this is that it becomes harder and harder to live and be yourself. And have you ever noticed that old laws are rarely repealed. My friend Carey tells me that there is still an old law that if your horse is going to cross a road where there are automobiles, you have to get someone to stand in the middle of the road and wave around two red flags. Another reason why laws are getting complicated is because of litigation. Government authorities are making more laws to protect themselves and us generally against litigation. This is why for example Guyfawks night, when the public use to set off fireworks, was banned in Australia in the early seventies. Another reason why laws get more complicated is to protect people, which is what litigation is generally concerned with, but in some cases there is general concern for individuals rights. Take for example laws telling us that we now have to wear a helmet when we cycle a bicycle. This protects the individual, but by the same token the government and society has to take care of the individual if he or she gets brain damaged. The driving force behind the evolution of laws are people. Those with the strongest opinions most forceful voices call for change and the politicians react once public opinion sways that way as well. Change is also takes place as new situations arise, which they invariably do, such as some kids dies because she used a go-cart at an age she was not properly skilled to handle it (this actually happened), and when say a young boy dies from making gunpowder, for which the ingredients were available until the mid-seventies. Change also takes place when new situations arise in actual court cases and the law is not appropriate to deal with a particular situation appropriately. An example of this is with tax laws, where big corporations seem to (endlessly) find loopholes in tax laws.

The fact that laws are becoming more complicated is evident when we note that lawyers have to specialize more and more. There are tax laws, criminal laws, business laws, family laws and there are special courts to cater for each of these areas. And as time goes by, these areas are also split. Family laws, for example, needs to develop specialized expertise in superannuation.

Some laws are also quite stupid and senseless, but we are expected to follow them regardless. A particularly interesting case of this relates to traffic laws. In the state of Western Australia (where we drive on the left hand side of the road), one use to indicate only when exiting from a roundabout, but it is now required to also indicate if you are turning right before you enter a roundabout. This is a silly because you must suddenly swap your indicator from right to left just as you are leaving the roundabout - a double change. There is really no need to indicate that you will be turning right, but if a traffic policeman sees you not indicate properly, they will come after you and write you out a ticket. Also at one time one was a serious offence to do U-turns at traffic light, but now it seems to be okay to do so. These are examples of where the police will happily follow a particular rule when it is clear quite unnecessary or quite stupid. Most people are prepared to accept things like this without question, as it is our human nature to copy and accept what others are doing.

Politics is where laws are made, and politicians are invariably influenced by public opinion and fashionable memes. The media plays a prominent role in reflecting this public opinion and instigating change. Political parties are also constantly holding polls to ascertain public opinion to see which is the best way they should act to stay popular. In fact politicians and political parties often act indifferently to their own opinions just to capture the majority view. They endeavor to tell people what they want to hear. The same of course also applies to the media. Current democracy is a meme, or an idea, which is slightly different to the way that laws are made to balance the situation, as the majority of opinion wins out (that is, which political party wins office). This is however not true democracy as the opinion of close to half of the people is not reflected by an election. In a random parliament, where the politicians are chosen by a ballot from the general community, as was done in ancient Greece, a more balanced memetic view would be achieved (G.A. Christos, "Random Democracy").

I use to hate politics until I thought about memes more carefully. Here is a system where the participants live and die by their actions, whom everyone is observing. The actions of politicians are reported in the press, some take off, some don't, what are the factors that influence this? Politicians are also listening (or maybe just pretending) to listen to the people of the country, to voters in their electorate, and politicians aspire to be politician because they are acquiring power and the ability to control and influence other peoples memes.

Politicians love memes, or at least spreading them through the media. They endeavor to discover meme (or ideas) that spread quickly and widely, that either enhance their reputation or embarrass their opposition (so as to improve their prospects of re-election), or agreeing with the most popular view. In fact most politicians spend more time worrying about these things than actually running the country. Most of the time in parliament, as seen in live broadcasts, is spent doing precisely this. Politicians also use the media, which is powerful vehicle of memes, to spread their memes, and to monitor and reassess their position. Polls, or public opinion, or meme beliefs, are also widely used to find new memes and position to take.

Today's society is extremely complicated, but it has all been built up, and continues to develop through small interactions between people, exchanging memes and ideas. It can be viewed as a global emergent property arising from many simple local interactions. This applies to our legal system, health system, education system, political system, financial system and science itself. This phenomenon is widespread in nature. Water molecules organize themselves into elegant clouds, yet each molecule only 'knows about its local conditions. The brain consists of a collection of dumb neurons whose only function is to 'fire', or emit an electrical pulse when they receive sufficiently excitation from other neurons, yet from this emerges vision, emotion, consciousness, movement, and the ability to learn and adapt from the environment.

Laws recognize that there is a self memplex in that they protect people from slander and liable. It is a basic right that one's ability to be liked (so that they can spread memes and be listened to by others) should not be compromised by someone sinister. These laws are really in place so that we all have a fair chance to spread our memes. There is nothing more important than your reputation.

### Social welfare and equality

If someone does not do well, they are taken care of by the social welfare system. People are made to pay taxes, which are used to fund medical research and to help those with need. Why is this? Why do we help those with weak genes (like the sick) and weak memes (like the unemployed). What advantage is it to our own selfish genes and memes to help others?

Laws are also evolving to make all people equal. We have laws that respect racial equality, sexual equality and religious equality, for example.

There is of course altruism, and the altruistic trick used by memes as expounded by Blackmore (EXPAND!).

A very frightening fact is that large companies can often win an argument sheerly by their resources. There are many examples of where companies can squash individuals and smaller businesses by running them through the legal system. They win because the other party just runs out of money. The tobacco industry has been able to maintain the sale of its product in this way as well, even though it is well known that smoking is a major health hazard. If someone is to win a court case against them, such as in Australia recently (GIVEN DETAILS), they will appeal until the other person can no longer take part. In this case the original applicant died. The tobacco industry can also do its own research to try to make tobacco smoking look like it is not that harmful. The power of money, the power of being big memetically is an enormous agent to protecting one's own memetic (and business) memes.

### Propaganda, war and the war in Iraq

As we have already seen, the media plays a prominent role in politics and internal affairs, and politicians exploit this to their advantage (or try to anyhow). This is because most people believe what they read in the newspapers and see on television. The underlying reason why this is so is because we copy each other, and this entails believing others and readily accepting other people's views, especially if it is something that is broadcast to a wide audience. In the 1960s and 1970s during the 'cold war' the Soviet Union convinced most of its population through its media that they were the good guys, and that the Americans were the bad guys, while the Americans convinced the western world that the Soviet Union was evil, and could not be trusted. The media has a powerful influence on people's opinions and beliefs

What is strange about nationalism, particularly in new-founded immigrant countries like the United States of America and Australia, is that its people do not have a very strong genetic link to each other, but there is nonetheless a strong sense of belonging. This suggests that their patriotism is a memetic thing, linked together by common ideals and beliefs, culture, and upbringing, and most of this is generally molded by the media, which projects nationalistic furor, particularly when it comes to national achievements. In the case of Australia, our involvement in so many wars (and the associated camaraderie), and our high achievements in sport tends to bond people together.

An especially interesting propaganda game is being played out right at this moment, in the war in Iraq. I started writing this just as the war began, and finished just as it ended. What is especially intriguing about this war is that it is really being played out on television. Even though many lives are being lost on the battlefield, the real war is being fought on the political front in the media. We would like to demonstrate how various aspects of memes play a prominent role in this, like human nature (copying, believing, and expounding opinions), the importance of information transfer (media and intelligence), the need to convince others, the spread of information (its rate and distribution depth), control over others, and material possessions.

As already noted above there is the gullibility factor. People tend to believe what they are told by the media. If you repeat something often enough, irrespective of whether it is true or not, it becomes to be accepted as truth. The Americans claim to have invaded Iraq to rid the Iraqi military of weapons of mass destruction in the name of anti-terrorism. So far there has not been any real evidence that Iraq has any more chemical or biological weapons or that it is linked in any way with terrorism. Later, after invading Iraq, the Americans and their allies shifted the goal posts and made claim that they were now in Iraq to free the Iraqi people from their sadistic dictator Saddam Hussein, even though the Iraqi leader seemed to be very popular. (The Iraqi population was rallying behind him before the war started). The Iraqis claim that the Americans started this war to gain control over their region, the Arabic and Muslim world, and to get their hands on their oil. The Americans have long wanted to go into Iraq. They wanted to gain control over Iraq back in 1991. They may well be using the fear of weapons of mass destruction and the threats of terrorism in their own homeland, and the freedom of the Iraqi people to justify this invasion. One of the other main reasons for this invasion may be because Iraq has always posed a treat to Israel. It is well known that a considerable portion of the American newspapers are owned by Jews, so they have a lot of influence of public opinion and hence that of the American administration.

It is hard to know exactly what is going on because there is so much biased reporting and propaganda, and we generally receive a very biased viewpoint in our own media, just as the Iraqis did before the regime was toppled. To arrive at a more balanced opinion of what is really going on, one has to think about matters and not accept them as they are presented in the media. This involves spurious memories and is

unfortunately something most people simply do not do. It is much easier to go with the flow, copy and accept other opinions, than to actually think. What is particularly interesting to me is that the Americans are going out of their way to hinder the ability of the Iraqis to have their say in the media.

While the Americans were claiming that Saddam Hussein is an evil man, the Iraqi regime were suggesting that he is much loved by his people, and there is no evidence that Iraq is linked in any way with the Al Quaida network and the terrorist attacks on the World Trade Center on 11 September 2001. The interesting thing that intrigues me about all of this is that they do not really need any evidence. As long as they keep repeating their claim often enough (whether or not it is justified), there are enough gullible people who will believe what they are told. War also sparks a patriotism (a sense of belonging to a group) when we feel threatened. Incidentally the approval of the US president George W. Bush went up from 51% to 70% after starting the war. The other justification for this war is that Iraq has weapons of mass destruction, even though there is little evidence for this, and Iraq was complying (somewhat reluctantly) with the United Nations in its investigations. America and its allies invaded Iraq without approval from the United Nations, claiming they were sick of waiting.

Incidentally, one may also ask why it is that countries like the USA, and some others on the Security Council, are allowed to have weapons of mass destruction (like nuclear weapons), while the rest of the world is forbidden. We do not really know if the Americans actually have chemical and biological weapons of their own. And why is it that the Americans are allowed to have such a sophisticated military presence all over the world, but as soon as some other country, but not so other countries not allied with them. The answer is one of control. The most powerful countries want to remain just that, powerful, and the reason for this is that they then impose themselves onto others, which means their memes and beliefs.

The Americans has said that they will not steal Iraq's oil, that it belongs to the Iraqi people, but the first objective of their invasion was to secure the oil wells from destruction by Saddam Hussein. They say that they are trying protect this natural resource for the Iraqi people but their actions are resulting in the death of many of them thousands of innocent women and children (and soldiers for that matter, who are only trying to protect their homeland - not to degrade in any way the poor allied soldiers who are also dying needlessly carrying out their orders) in the process. And once control over Iraq has been gained, who will buy this oil and set its price, and how will one fund the rebuilding of Iraq?

We all have an opinion, and I am sure my opinion about the necessity of this war has already been reflected by what I have said above. In my view one has no right to interfere (or use force) with the internal affairs of a sovereign nation and kill people, unless they are doing this to you. All wars are inevitably pointless. We are all entitled to our opinion, but what is particularly interesting is how do we form an



opinion. For the most part we form an opinion based also on our own previous experience and values, but much of this is formed from listening to others, our friends, family and most importantly the media. Very few of us really think (or in my language, generate and utilize new spurious memories) about what is going on around us. We are more inclined to believe what we are told, accumulate and gossip. I have often argued about something with someone and found them to be expounding only what they saw on the television the night before. It amazes me how often this happens.

Once we have an opinion it is difficult to change that opinion, unless we are presented with some new startling information to persuade us otherwise. We tend to defend our view (recall this is one of the purposes of the memetic self) and argue it to others, trying to convince them of our own views. We do this because we have a hidden agenda to spread our own memes, and the memes we have just acquired. This is exactly what is happening at the moment. We have people marching in the streets opposing the war, and others arguing the merits and necessity of the war. The population is becoming polarized one way or the other. It is difficult not to become so, but as time goes on and more information is made available more people will swing from one side to the other, and I suspect more will swing towards the unjustness of this war. The fact that the Americans won this war so quickly worked in their favor, because the longer the war went on for, the more people would have been killed (innocent people as well as the allied troops), the more public opposition it would have generated, not only in the Arab world but also in the United States of America.

Another aspect of this war is that America claims that it is stamping out terrorism, but in reality they are encouraging and germinating it. Their actions will further polarize the Arabic and Muslim world into anti-American fervor. America may well be strengthening the terrorist revolt instead of quashing it by its actions. And if they think that by killing Saddam Hussein or Osama bin Laden that they will stamp out terrorism, they should think again. If either one of these men are killed they will become martyrs, and the meme they started will live on and prosper by their death. Instead of having one Osama Bin Laden, they may find that they spawn many other just like them.

Now that the war has started, we find that both sides are heavily involved in a propaganda war, and the outcome of this propaganda war will determine who really wins and who really loses (in the minds of the people of the world). The Americans are showing us pictures of their success, making accusations that there may be chemical weapons in Iraq (without real evidence - they even claim to have destroyed one plant before their claims could be verified). The aim of this is to win public support, in their own country and internationally as well. The Americans are also trying to use their success to convince ordinary Iraqis not to resist the invasion and to encourage them to join the revolt to remove their leader Saddam Hussein. In support of this claim they are calling this 'operation Iraqi freedom'. In an effort to win public

support in Iraq and convince the general Iraqi public that they are there to help them, the Americans have even made broadcasts on Iraqi radio and dropped leaflets to get this message across. This has not gone according to plan, and the domino effect has not materialized. On the other hand, the Iraqi regime is showing its people the success its army is having (which is scant) against the high-tech American army (and technology is a product of memetic evolution itself), to spur them on to continue to fight. The Iraqis are also showing images of slaughtered innocent people (women and children) to win support from other countries around the world and to ignite the Arabic world against America. In addition to this they are showing pictures of captured (and killed) American and British soldiers on television to win public support in America and Britain. They hope that these images of dead allied soldiers and of innocent people will also sway public opinion against the war in America, Britain and Australia, and this will lead to an end to the war. No one likes to see innocent people or young soldiers dying in war, and heavy casualties will force the administration of these countries to stop the war, because let's face it governments are themselves also slaves to the public, as the public is to them. The Vietnam war ended when images of war were shown on television. I am quite surprised that the Americans did not consider the fact that this war was going to be shown day and night on live television. Someone obviously did not take into account the power of memes.

As noted above, this war is quite unusual in that we are constantly being kept up to date with what is going on television (day and night on some channels), and both sides are heavily engaged in a propaganda war. The side that will win eventually (no matter who loses the most troops - they are pawns in the game so to speak while the real political war is being fought out in the media) will be the side which wins international support. What I found particularly interesting is that each country has various spokespersons who are constantly projecting their propaganda to the world, in an elegant and convincing manner. You often see the president of America George W. Bush, the Prime Minister of Britain Tony Blair, and the president of Iraqi Saddam Hussein, as well as all of their advisors and entourage on television arguing their ideological position. Each is trying to spread their memes and beliefs, trying to convince as many people as possible that they are right and the other party is wrong in this conflict. The Iraqis even have a Minister of Information, which I find to be quite interesting. This is a very memetic position indeed. On 24 March 2003, the Information Minister of Iraq, Muhammed Saeed Sahaf told the world at a news conference that hundreds of civilians had been killed and thousands had been wounded by allied bombing in Iraq since the start of the war. This was obviously designed to win international support to stop the war in Iraq.

The power of the media is well recognized by both sides in this war. This is why the Americans bombed the Iraqi television station after one week into the conflict and bombed the Ministry of Information shortly after that. Telephone and Internet communications have also been largely severed to stop the Iraqis from getting their message out to the world. I think this is abominable. All people should have a basic

right to express themselves or present their side of the story. The Americans have also destroyed various other communication systems that could be used by the Iraqi regime to communicate to its army forces. Communication (information transfer) is essential to plan a strategic response to combat invading forces. Some American television stations, who are incidentally broadcasting this war 24 hours a day, have even sacked a few journalists for not reporting what they want the American public to hear. The reason why there is so much reporting going on is that we generally love it. That is our nature. All the media outlets are trying to do is satisfy our needs and make a little money from it in the process. Television stations are running reports on the war constantly, utilizing the global network as much as possible. Newspapers are wrapping their usual newspaper with extra pages just on the war. The memes associated with this war are out of control. We hardly get any other news at all.

The power of the media is reflected in that reports shown in neighboring countries like Syria and Pakistan is stirring emotions in these countries and causing much civil unrest. In Pakistan more than half a million people marched in the street to protest about this war. There was even an even bigger protest in India, which is a Hindu country. The passion behind what is going on is refelcted by the fact that some Iraqi dissidents, who fled Iraq to escape from their dictator Suddam Hussein, are even now returning to fight for their country and other nationals are prepared to sacrifice themselves as suicide bombers for what they are calling a holy war. It is a real pity that the military intelligence in America did not consider the power of information transfer and the human mind in this conflict before it started the war. Information has a habit of eventually finding a way to get through any obstacle. This is the power of memetic transfer, and the human mind is so adept to the spread of information and communication.

As note above, the media is constantly broadcasting this war on television, which is some ways is the first war made for television. This represents a first, and a new type of war, that we have said will be won or lost in reality as it comes across in the media. What I find a little disturbing about all this media coverage is that our children are also watching it, and this would be conditioning them to war and fighting. We copy animals cannot help but be influenced by such things. As we note elsewhere, similar massacres, such as of children in schools, generally follow after someone initiates such a thing and it is reported extensively on television and the media.

One of the best biological 'weapons' used in spreading their memes (here their ideologies) is fear. The Americans are using the terrorism card whereas the Iraqis are using the attack on personal freedom like religious belief.

Another interesting aspect about war that intrigues me is that most religions hold it that one should not kill other humans, and we have a situation here in which two very religious countries are doing just that. Incidentally the Americans and British are generally quite religious Christians.

One also needs to ask why it is that countries like the USA and Britain are allowed to have chemical weapons whereas countries like Iraq are not allowed to. The other thing about all of this is that there are international laws to deal with matters of international dispute and there is a United Nations to deal with such disputes. Here all countries have some say in what is right or wrong, but some countries, like those on the Security Council have a privileged veto vote, mainly because they were the first ones to develop nuclear weapons. It seems to me that this war and the way the United Nations is set up is to preserve the power of the strongest and most aggressive nations, and the reason why these countries want to keep their power is that this means that their memes, or ideologies will be heard and adhered to.

The other reason why America and Britain have invaded Iraq, or so they claim, is to rid the world of terrorism, but what they need to realize is that even if they are to kill someone who they believe represents these actions, like Asama Bin Laden or Saddam Hussein, they can never kill the ideology, the meme. In fact by killing the leader they are martyrizing them and the memes will only get stronger.

Another interesting aspect about this war is that Iraq seems to be using civilians to fight the allied troops. The Americans are calling foul play as they are rules of war as set down in the Geneva convention, which is particularly interesting in itself in that rules are memes are we even have rules of how we can fight and defend ourselves during a war. The Iraqis on the other hand claim that the invasion of their land is illegal and they can hence defend themselves by any means they choose, buster any rules set down by any convention. They have even threatened that they will use chemical weapons if they have to, assuming they have any left, and the Americans have not ruled out using a nuclear weapon if Iraq resorts to chemical or biological warfare. The Iraqis are probably reluctant to use any weapons of mass destruction because they are winning the political war and doing so would turn public opinion against them.

Another way in which information plays an important part in a war like this is through intelligence. This may encompass strategic maneuvers (knowledge of how to best defeat the enemy on the battle field) and military intelligence, which is generally obtained through using sophisticated systems (like spy satellites) or espionage. It would seem that the allies have been using information they have obtained from Iraqi defectors to obtain knowledge of where Iraq has its main military facilities. They recently used such inside information to help free an American soldier, private Jessica Lynch, who was being held in an Iraqi hospital deep in enemy held territory, for example.

As mentioned earlier this war has polarized most people one way or the other. It is hard not to have an opinion with so much coverage on television, with so much emotion and in particular with the death of other human beings, many innocent. We are now also seeing professional people like actors, senior public servants (some resigning from their positions because they find this war to be unconscionable), ex-

army personal, and even politicians saying things about the war. They are either using their high profile memetic position to express their personal view, or in some cases to gain fame themselves to increase their memetic influence in the future. Many actors at the recent Academy Awards chose to make some sort of statement about the war. The actor/director Michael Moore made a strong attack on the American president, claiming that this war was based on fictional reasons. I am myself expressing my own opinion for similar reasons, I guess. We generally express our views to spread our memes, gain recognition (fame), or because we are just different (creative) than others (the flock that copy and do not think). Some people can see through the camouflage and think independently of what they are told to believe be the media and the politicians. Some see an injustice that other people simply do not see, and they want to change that view of the masses. Sometimes doing so can be an extremely dangerous thing to do, at least in the short term. Sometimes when public opinion swings right around, those who were brave enough to say something against the grain are hailed as heroes of humanity. This is as we saw earlier how things work is most human endeavors. Esoteric scientists, for example, are particularly subject to this.

After America and its allies took control of Baghdad and the Saddam Hussein regime had fallen, the people of the city started looting all of the shops and government buildings. This is because there was no one to enforce the law (memes) and once someone started looting everyone started doing it. And after the Americans had destroyed the television station in Iraq, the only station that was available to the Iraqis was delivered to them by an American hercules aircraft. What they got were messages from the president of the United States George W. Bush and the Prime Minister of the United Kingdom Tony Blair, telling the Iraqis that they were now rid of their sadistic dictator Saddam Hussein.

Another interesting memetic aspect of the way the war ended is that many Iraqis started to discard their uniforms when it became clear to them that they were going to be defeated by the American allies. Once this process started more and more followed suit and eventually most of them copied this method of surrender.

It is also interesting how after surrender the Iraqis who do not like the American occupation of their country, are now using the media to voice their opposition instead of fighting them with arms. Daily demonstration are taking place in Iraq. They have come to realize that the war is really being fought in the media and not on the battlefield. This is posing a much bigger problem to the powerful Americans, who in the end easily stormed into Iraq and removed Saddam Hussein. Iraqis are now marching in the streets and protesting, and showing pictures of innocent children who have been maimed by the American bombardment of their country. What is more is that the Americans can no longer stop such reporting from going to air. There are plenty of television networks which are happy to relay these messages, perhaps also encouraged to do so after the void that was left with the end of the war.

## Restoring democracy in Iraq after the war

An interesting scenario has now developed in Iraq after the war. The Iraqi people (with the help of the Americans) have to form their own government after being ruled for such a long time by a military regime. There are serious problems with the implementation of a new style of government that will work, as there are many factions and religious groups in Iraq and it is important that they all have some say in the new government, otherwise civil unrest will result and continue. I would surmise that this is one of the main reasons why countries like Iraq have inevitably evolved to have a military style dictatorial style of government.

Governments play an important role in human life, as they enable human beings to coexist together. Governments are required to make laws (memes) so that we (memplexes) can live in harmony. By the same token we do not like to be over-restricted in our beliefs and what we can do, and we all want to have some say in government. This is once again a meme thing. What is ultimately desired is a style of government that somehow distributes power as equally as possible. I will take this opportunity to say something about a revolutionary (but ancient) parliamentary system I have been thinking about in my spare time.

The problem with traditional western styles of government is that there is generally one winner (or a coalition of winners), and the government is formed by the political party (or parties) which gets over 50 percent of the vote. This inherently means that up to 50 percent of the population do not support that government. This system with its many flaws (to be detailed below) is happily accepted in western countries, because we have been conditioned to thinking that this is democracy, whereas this is a myth, perpetuated by misinformation from politicians (who are clearly advantaged by such a system) and subsequently by the media, who accept this notion uncritically. The situation is quite different in countries like Iraq, where this conditioning (or brainwashing) has not taken place. If a single party or ethnic group (or groups) wins power in Iraq, the other factions, which will make up to half of the population, will not be happy and civil war may well result. Incidentally, one of the reasons why a military dictatorship may have evolved in Iraq is that this may be the only way to keep peace in a country with such diverse (and passionate) ethnic and religious groups. By the same token, countries like the former Soviet Union and Yugoslavia seemed to work best under a communist style of government, and have found it difficult to make the transition to a western style democracy.

There are basically two outcomes that can come out of a voting system of democracy like in western countries. If there are a lot of political parties (like in Italy) various factions will have to get together to form a government. The problem with this is that it is inherently unstable, as is demonstrated by the volatility of the Italian government, which seems to change every twelve months or less. The other possibility is to essentially limit the number of effective political parties to two (or three), as in the United States of America, the United Kingdom and Australia.

Australia achieves this by adopting a strange preferential voting system which we would like to say a bit more about before posing a solution to the Iraqi problem. Our discussion of the pitfalls of the Australian political system is motivated after our prime minister John Howard suggested in recently (April 2003) that Iraq may do best if it adopted our own political system. Nothing could be further from the truth. In Australia some parties receive around 10 to 15 percent of the vote but are not represented in the legislative parliament at all. This situation would not be tolerated in a politically volatile country like Iraq.

Another major problem with the preferential voting system, used in Australia, is that your vote as an individual is essentially useless. If you live in a 'safe' seat (in Australia this means a seat that is normally held by the Australian Labor Party or the conservative Liberal Party) your vote is unimportant. Furthermore in Australia most seats eventually fall to one of the two main political parties. If you vote for any other party the preferences are distributed from the bottom, or that is the candidate with the lowest number of votes, until there are just two candidates left. In this case, your vote almost always eventually goes to one of the two main political parties. All that really matters is how you ordered the two main political parties with respect to each other. In fact in Australia the only seats that really matter in determining which party forms government are those seats which are close. However if you live in one of these seats and support one of the main political parties, it also does not really count, as the final decision on who wins that seat is determined by those people, termed 'swing voters', whose decision is usually made in the dying days of the election, depending on how they are swayed by the media and publicity. In summary the party that gains power in Australia is determined by a handful of people who cannot make their minds up for themselves and their decision is easily persuaded by the media. Swing voters are not necessarily a bad thing, because at least they think about some issues, whereas some people continue to vote for the same old party (generally the same as their parents) no matter what happens. This is a much more serious instance of copying than believing what you see in the media.

An interesting alternative to the usual style of democratic government in western countries, is to actually randomly select the members of parliament. This form of government is actually more democratic than the systems we have been lead to believe are democratic, and was actually used in Athens and other Greek cities in ancient times where and when democracy first developed.

In ancient Greek democracies women and slaves were disfranchised, but all other citizens (namely men) could become involved in all aspects of government. People who wanted to have a say in what was going on were able to attend the meetings held in local halls (Bertrand Russell, **History of Western Philosophy: and its connection with political and social circumstances from the earliest times to the present day**, second edition, George Allen and Unwin (London 1961). This system became unmanageable when the population of the ancient cities and their rural surroundings became too large for

everyone to be able to attend. A system where participants of government were chosen by lot, was later used in Sparta, where an assembly of citizens (called the 'ephors') were chosen to oversee the powers of the king. This system spread to other parts of Greece. As far as we can ascertain the present representative electoral system, which we refer to as democracy, was never used by the ancient Greeks yet we frequently refer to this period as the root of our own 'democracy'. This is a fallacy which has been propagated to us by politician, and all the other people who believe them, as they enjoy an unrivalled ability to maintain power for their political parties and their ideologies. The two main political parties take a bipartisan stand on issues affecting their political advantage.

Contrary to popular belief the present representative electoral system is not really democratic or fair. In the present system we are essentially represented by only a few political groups. In an ideal democracy a country should be governed by all of its citizens, and there should be virtually no politics (J.J. Rousseau, **The social contract**, originally published in 1762, translated by M. Cranston, Penguin Books (London 1968). This situation is currently unattainable, as all citizen cannot have a direct input in government, but a very close approximation to this can be achieved by randomly selecting the governing body from the public by what virtually amounts to a giant lottery (G.A. Christos, **In search of democracy**, Curtin Gazette, Vol. 7, No. 1, 1994, pp 22-24). In this 'random parliament' ordinary citizens are chosen to be the parliamentarians from a large population database using random number generators and computer technology, and there are no elections. The situation is similar in many ways to a jury system. In the future when we are all connected to the Internet, true democracy may well be possible. (M. Margolis, **Viable democracy**, St. Martins Press (New York 1979).

There are great advantages with a random democracy. Firstly there is virtually no politics, and certainly no political parties. This means that parliamentarians will not be in debt to their party as in current political systems, where they have to effectively toe the party line on most issues. Political groups may of course form within the random parliament, but this can be minimized by randomly replacing the parliamentarians constantly instead of having general elections every four years or so. If there are 1000 random parliamentarians, say, they could be replaced at the rate of 20 each month so that on average they are all replaced over a four-year period. In this way there will always be a group of parliamentarian who have some experience in government at any time. If the whole parliament was dissolved at the same time we would have the situation where no-one had any experience at all coming into government. Western democracies are also open to corruption in that politicians who attain positions of power can be influenced and bribed (and indeed they are), and many politicians have to do favors for those people and groups who helped them get to where they are.

Another advantage of the random parliament would be that all groups are equally represented, not just politically active groups. There will be as many woman in the parliament as their proportion in the population, for example, and the parliament will



not mostly consist of older and middle-age egotistical and power-hungry men with a legal background. In the same way young people, truck drivers, doctors, academics, shopkeepers, etc, will all be proportionally represented (and why shouldn't they). Yet another positive feature of a random democracy is that since there are no sustainable political groups within the parliamentary system, all groups will be working together on the same side, all working together for the good of the country.

One may think that this style of democracy cannot work, as there will not be enough skilled people to run the country. Who, for example, will be able to administer the health portfolio? With 1000 random parliamentarians there will be approximately 20 people who work in the health industry (like doctors, nurses, hospital administrators, and old-age carers), who will actually have 'hands on' experience in the industry. In the same way the financial and transport portfolio can be managed by people who work in these areas. The random parliament will also be receiving direct input from the general community, which will be uniformly represented in this system. Who better to govern the country than ordinary citizens, who are more in tune with what is actually going on?

One should also bear in mind that politicians do not actually devise policies and develop new laws, but that this task is overseen by the various public service departments which go hand in hand with government. There is no reason why ordinary citizens cannot perform the functions of politicians and judge the merits of new policies and ideas presented to them. If a random parliament was to be introduced into a western democracy (we can only hope it will one day) the transition could be made smoothly by supplementing the current political system with random parliamentarians. After that all the politicians could be gradually removed leaving only the random parliamentarians. Once a random parliament has been formed it is important to slowly replace the parliamentarians on a regular basis. This will ensure that one is not suddenly confronted with the situation where nobody has any experience with government. This can be achieved by randomly selecting parliamentarians to be replaced at the rate of say 20 each month. In this way the average lifetime of a parliamentarian will be 4 years. To implement a random parliament in a country like Iraq from scratch can be quite tricky, as one does not want to have to begin with the situation where the parliament consists of a bunch of people who have absolutely no experience. A way around this would be to initially start with a mix of a political system (elected representative or appointed administrators) and a random parliamentary system (selected representatives) and then gradually replace the elected and appointed representatives so that eventually the parliament consists of parliamentarians alone.

In the random parliamentary system there are no elections and this will save an enormous amount of money in running an election, as well as the political campaigns, propaganda and advertisements that usually accompany elections, which can run for well over a month or longer. Elections generally also distract politicians, as does politics generally, from carrying out their usual duties.

Another feature of the random parliament is that special interest groups, who seem to have a lot of power, will not be able to lobby and hold the government to ransom. What generally happens is these special interest groups, who have a strong media presence, are able to persuade the public (actually all they need to do is influence the swing voters and subsequently the politicians) to vote one way or the other based on their particular concern. The two main political parties need to consider these concerns and are often forced to make all sorts of promises to these various interest groups to try to win their vote, and more importantly their electioneering campaign. This is unfair because these groups have a lot more say than other people, and they generally do get their own way.

The only question that remains is how will the parliamentarians be selected in a fair and workable way, and the answer is surprisingly simple. Mathematicians and computer programmers have algorithms which are able to essentially generate random numbers from which people from the public can be selected to enter the parliament, or deselected to leave the parliament to be replaced by someone else. The random parliamentarian can be chosen from people on the electoral roll, but if someone does not want to participate in the random parliament they should have the right to decline.

Back to Iraq. In Iraq there are numerous different ethnic and religious groups, and only some of them will not have any say in governing the country if a western style of democracy is used there. Certain groups will have to get together and form a coalition to form government, while other groups who may have more support than some of those who form the coalition will have practically no say whatsoever. To exacerbate the problem some of these groups hate each other - that is the way different religious groups generally interact (a meme thing again). The other problem is that in certain regions (or electoral seats) where a particular group is in a (slight) minority, this group will not have enough voters to win any representation in the parliament at all, whether in government or in opposition. Such a style of government will lead to discontent and resentment in the political system. Also when the margin between winners and losers is so small, people will raise questions about the fairness of the election. The people of Iraq would not tolerate, or be able to deal with, for that matter, a close finish as that which eventuated in the United States of America where George W. Bush narrowly won the presidency from Al Gore. A random democracy avoids all of these problems and delivers a workable non-political system of government in regions where tolerance is difficult to maintain.

## Meme services: occupations and businesses

As strange as it may appear to say so, but our very occupations and businesses are really just collections of memes or ideas. A plumber uses certain knowledge or 'tricks' of the trade (memes) acquired from others to fix our water, sewerage, and gas systems; an electrician uses his acquired knowledge about electricity to wire our homes; a baker makes bread by using recipes and techniques passed on and developed by family and others; a medical practitioner uses medical knowledge (memes) to help us deal with health issues, a salesperson uses established sales tricks or sales pitches to successfully sell products (these are memes passed on to him or her by people who are involved with training sales people); a lawyer uses his knowledge about the law (acquired from books) to advise us on legal matters; and lecturers transmit their knowledge of expertise directly to us. [On the subject of salesmen I have to mention what happened when I took a new sports car for a test drive. The salesman would blatantly thrust himself backwards whenever I hit the accelerator and forwards whenever I hit the brakes. These actions were clearly designed to give me the impression that this vehicle was powerful and had excellent braking capacity. The salesman continued to perform even when I subtly told him I was aware of the illusion he was trying to create.] All of these people use memes they have acquired from others to make a living. When you stop and think about it, this is true for any occupation. We all have a set of memes that underlies our occupation and our contribution to society. This enables us then (through the advent of money, which we will argue below was also invented by memes) to buy other (memes) services and products (also memes) which we require to live in the memetic world.

Things have evolved this way because we can no longer do all of the things we need to do to survive in this complicated world by ourselves. We have come to rely on others for specialized services, and this situation has itself come about because of the evolution of memes, which has forced us to each search for our own memetic niche in society. This has caused an expansion in the list of services provided and eventually needed. We now need lawyers to represent us in courts. There are even laws preventing us from representing ourselves in some courts, and even some lawyers are themselves restricted from appearing in some courts. This has become necessary as the world has become more and more complicated, as special skills (memes) are required for increasingly complicated laws. We need plumbers to fix our plumbing when it goes wrong, and once again there are laws preventing us from even attempting to do our own plumbing (for good reason I may add).

Bigger businesses are also just bigger collections of memes (bigger memeplexes) connecting various professions and people together for their mutual benefit. Another interesting thing about businesses today is that they have to advertise to sell their product or service. This is particularly interesting because advertising is directly associated with the direct spread of memes, playing particularly on their fecundity, or ability to get copied. This is mainly driven by the ability of a meme to gain human attention, and all sorts of tricks have evolved to achieve this purpose. Today some

businesses are even solely established and maintained by intense advertising (see discussion below), and most businesses have marketing people - just take a look at the employment section in your local newspaper to see how many marketing jobs there are.

Not only are all jobs and businesses just collections of memplexes which enable us to survive in a complex society, and contribute to it in some way, but in many cases there are actually professions which are intimately associated with the direct transmission and spread of memes and information, like in the advertising industry, the media, education, and statistical data collection services. This is a rather strange situation when you stop for a moment and think about it. These 'industries' are generally not required for our biological survival. The growth of these information industries in recent times is staggering, and the reason for this is once again based on the evolution of memes, as memes (or information) becomes more and more accessible and important.

The fact that businesses are just networks of interconnected memplexes also explains why they evolve, and why they have to keep evolving to remain viable. They rely on each other and each must utilize new advances in other disciplines. If a plumber, for example, does not keep abreast with the latest techniques and gadgets in plumbing, or if a dentist does not adopt new methods in dental surgery, or if a business does not accept electronic payment for goods, they soon go out of business. And as the world of business gets more complicated we have to resort to lawyers, accountants, and advertising experts to assist us. This is because businesses impact upon each other in a complicated interconnected network of dependencies. Underlying all of these changes are what the majority of the public decides it needs. As the world of business evolves, some businesses go bankrupt (because they become outdated, cannot survive the competition, or they reject or do not implement change quickly enough), while others grow into bigger and more powerful companies. New businesses are also constantly emerging to fill new niches and opportunities as they arise.

In this chapter we explain how it is that all of this codependence (and competition) got started in the first place, how it came to be that money was invented, how businesses work, how advertising works and how financial systems, like the stock market, work, from the point of view of memes.

### The evolution of society and codependence

Just a few hundred years ago, families would have taken care of most of their own needs themselves, but as life became more complicated, with the advent of new gadgets, styles of living and laws, there were more things that had to be done. It became impossible to do everything by oneself, and then it became necessary to perform specialized services for others, in return for services and products from others. We came to rely on others. For example, we had to get a blacksmith to make shoes for our horses, simply because it became impractical for us all to have to build a hot fire to melt iron every time we wanted to mend a horse's shoe. Today we have to take our cars into automotive service centers to have them repaired. It also became practical for us to buy our food from others, instead of growing it ourselves. This also diminished the risk of famine when something went wrong with our own crops. But in order for us to be able to buy these products and services, we had to find some service that we could perform for others in exchange for

receiving these favors. The endless search for our own niche in society is what caused the whole system to start evolving and what made it what it is today, and this is why we now 'need' so many services (they evolved and we became to rely upon them) and why society continues to grow in complexity. An example of this is dishwashers. We now need to have a dishwasher because we have less time to wash our own dishes, and then we also need to hire people to repair them when something goes wrong.

The growing complexity of society and the need to find a niche for ourselves is what has driven us to require more and more education. Just 25 years ago it was enough to have 10 to 12 years of schooling to land decent job with a company or government department. Most of us now require tertiary training, and even this does not guarantee that we will find a job. Even nurses today have to have tertiary training. The reason for this is that medicine has become exceedingly more complicated and mistakes cannot be tolerated, especially with litigation. What is more, as more and more people need to do tertiary education to find employment, the cost of tertiary education continues to grow. This simply reflects the market and need have specialized training.

Another attribute of the growing complexity of society and increase in litigation is that many businesses need to constantly develop new quality control measures and review practices, to protect themselves from different situations that may eventuate.

The reward we receive for our services, in the form of money, which we can then use to buy services ourselves generally reflects (but not always - scientific minds are grossly underpaid!) the needs of others and this is why we seek professions where the demand exceeds the supply.

This is how I would suggest that cooperation and codependence started. Once this all got going it became increasingly important for us to all find something that we could do so that we can receive all of the services we required from others. As we all went about finding our own niche in society we developed new businesses and needs, which in turn made the world a much more complicated place to live in, and this non-linear process increased our reliance on others. Today we need to hire specialized people like plumbers, electricians, mechanics (to fix our cars), lawyers, accountants (to do our taxes), teachers (to teach our children how to read, write, and learn), farmers to grow crops for us, builders to build houses for us, engineers (to build buildings and roads for us), and politicians (to represent us - and give us a hard time). It is actually quite amazing how far we have come in the last 40 years or so, and we now have many people doing things that we do not really need from a biological perspective, such as fixing our computers, providing entertainment for us (on the movie screen, television and radio), and providing places and things of leisure, which are for our own selfish needs. All of these things evolved memetically, or through the exchange of information and services between people. As another example of how things have become more complicated, consider how many people are now required to make a movie or a music video. To make a movie you need a producer (and sometimes various types of producers), a director, actors, cameramen, camera director, hairdressing, someone to handle continuity, sound etc. And on top of this each of these people may require assistance themselves. An actor for example requires an agent, someone to do their makeup, prepare them for a particular part (for example with an accent), etc. When one wants to release a music single one has to almost certainly release a video as well. This has now become the norm, and one needs to hire all sort of people to achieve this.

As noted earlier we all need to find something that we can do in the memetic world that will provide us with a means to make a living, and buy the required (meme) services from others. In

many cases we wish to protect the (personal) memes which provide us with a living. If other people knew of our tricks and ideas we would soon be out of work. Special laws (memes again) have also been put in place to protect people and businesses from having their ideas stolen. Examples of this include copyright laws, and even names of companies and slogans they use are also protected. This is one of the reasons why companies seek to use an unusual name or advertising slogan. That way they are protected from theft by stealth. Companies and individuals are also protected from malicious harm by liable laws. In the need to find our own memetic niche in society, it is quite common for biological parents to teach their children the business memes that they know, and often their children follow in the same profession as their parents, often taking over the family company as well.

Also if a particular business or person is doing well, memetically speaking, then others invariably start to copy them as well, remember this is human nature. If someone is successful we imitate them. It is quite ironic to observe how often and blatantly businesses do this, something I never thought about much before I became acquainted with memes and their evolution. At one time I used to collect antique furniture until my sheds became too full to take any more. I used to buy from auctions. Suddenly everyone started buying from auctions, even dealers, and there were literally hundreds of shops around Perth. Then the market took a different turn, as dealers could no longer keep up their supply, they started buying from overseas, from England and Eastern Europe, and everyone followed suit. Then this business started to dry out as other people started to import furniture from Indonesia, where labour and wood is extremely cheap. Now most of these antique dealers have gone, and others have started trading in Indonesian furniture.

As society becomes more and more complicated and we all go about doing some service for it, not only are we having more services made available to us but we also become more reliant on them too. As an example, a car is very convenient but then we need to rely on people (or companies) to provide petrol, oil and parts for us; we need mechanics to fix them; and with time we have to use more and more specialized mechanics to fix various components of a car. We need to see distinctive people to deal with the air-conditioning systems, the gears and automatic transmission, the radiator, the engine, panel beating, etc. We need to get luxuries like dishwashers, home air-conditioners, televisions, video recorders, DVD players, computers and mobile phones, and we need to get specialized assistance to fix them as they get more and more complicated, and many companies protect themselves by not making their product too infallible. If a product was to last forever a company would soon run out of work, but if a product did not last long enough, to gain customer satisfaction, a company would soon run out of clients. What happens in practice is that a company engineers its products so that they last for some intermediate period in between these two extremes.

As noted earlier, service providers have to change with the times and learn about new techniques and technologies to stay in business.

Why did businesses evolve? Originally we had to specialize in certain occupations so that we could provide services for others for their services because it became too complicated for us to deal with everything ourselves, but then as this started to evolve, new businesses started to emerge, filling or creating new niches and market opportunities. ###some in providing such things as entertainment (like sport and movies), information services (Internet connections), advice on advertising, etc.

Most businesses are really just a collection or system of memes, where the proprietor,

an individual or a group of individuals, uses personal memes, certain knowledge, ideas, or 'tricks of the trade' to make money or a living. An individual can relieve himself of his hunting, fighting and gathering, by producing a specific product or service. A tradesman such as a carpenter for example will know how to work with wood, and plumbers use their set of memes to solve plumbing problems they encounter. Most of what he has learned, he has learned from other carpenters, maybe even his own father. An electrician knows about how to handle household electricity. The same is true for all other trades and professions, such as doctors, lawyers, carpenters, tilers, lecturers, and scientists. They all have their little tricks of the trade that enables them to survive, that is make a living with that type of employment in a complex evolving world. Luckily enough there are many different forms of memetic specialization that we can choose from in order to survive in this complex world. Why would such a system evolve, where people are essentially free to do whatever they want. Clearly cooperation between people is important in the transmission of memes and memes are slaves to this interaction between humans. It is also quite common for biological parents to teach their children the business memes that they know, and often their children follow in the same profession as their parents.

The situation is a little more complicated than just know certain memes to make a living. Many professions also require a creative element that humans are generally capable of achieving. New challenges emerge in our daily endeavours and human creativity plays a prominent role in enabling us to find solutions to these problems.

Most businesses (even well-established businesses) constantly seek that illusive meme, that will take off, or gain widespread acceptance by people. Bread manufacturers make different varieties of breads, hoping to develop a specific type of bread that will become so popular that they will gain control over the market. Chocolate companies will make new flavours of chocolate, cheese manufacturers will add different ingredients to chesses to try to find a product that will win the market over. By the same token businesses are slaves to the public, as they must make products accordingly to what the public wants, and they adjust their product so that it remains or becomes popular. If a company does not do this they may not survive. As an example, chewy companies have to keep changing their flavors and types of chewies so that products look new, and to follow trends where it becomes popular to buy small tablet style chewies or strips of chewies. Companies also have to change their flavors as people get used to them. It may be in my own imagination but when a new brand of chewies comes out it seems to taste better and last for longer, but as you start to get use to that flavor it last for shorter and shorter periods. There is a neurological angle to this as we do tend to get used to certain flavors and tastes through the process of habituation. Companies must take this into account and must keep changing their products to offer us something new, something exciting and different, to re-excite our senses.

Companies also change their products in the endeavor of finding something new that is exciting and may sweep the masses and make lots of money for them. This is probably the main reasons why they keep changing their products. If their new product does not make it, they take it off the market and try something else. It is quite amazing that today we have so many varieties of products to choose from. Almost everything we can imagine is made for us; veal is sold crumbed for us, chicken is seasoned, and there are even dinner packs with a complete dinner. We also have an endless variety of take away foods to choose from. Some of these products exist so that same businesses (and families) can make a living. There is an endless search by small businesses to find

themselves a little niche.

Companies also have to change with the times and be up to date with current thinking, or the current memetic state. They have to copy whatever seems to be doing well. It may sound quite trivial, but once it became accepted that purple wrapping was used for mature cheddar cheese, other cheese companies started to sue this color as well. Cheese companies are also all starting to sue easy peel wrappers.

Some products have to be compatible with current new laws and changes in public opinion. Tobacco companies, for example, need to find new ways to sell their product, which is the drug nicotine, in a way that offers more protection to smokers and by-standers. One thing that they are trying to do is to develop a cigarette that does not burn, but vaporizes nicotine from the tobacco. In this way the other harmful chemicals which are released from the intense burning process are eliminated or substantially reduced. We understand however that that without burning, these devices produce more carbon monoxide. New cots for example need to satisfy new laws relating to safety, which surface from time to time from unexpected deaths.

When a new product is being developed it is normally done so with much flair and many features. For example, new makes of cars are made to last, but then once the market has been captured the company will try to engineer the components of the car so that they only last for as long as is necessary by law. One often finds some car parts for example lasting for around 10 years without any problems but new parts only last for a year or two before they have been replaced. Builders tend to build houses today using the minimal requirements set down by the local authorities, whereas builders one hundred years ago built houses with pride. This has transpired because the market has been captured to a certain extent, as there are many more buyers today and finance is easy to obtain. Another example of this is when a new cough lolly comes out it is usually twice the size of other lollies. This is designed to get the product known, but once it is, the company invariably produces the product in the more usual size.

Businesses work together in subtle ways. Some businesses complement each other. What this means is that they are meme connected, not quite forming a memplex. As an example a car parts service company works together with manufacturing parts industries and automotive repairers. Sometimes businesses of the same type can also complement each other. In Guildford, a little town, now a suburb of Perth, close to my home an antique shop opened up a about 15 years ago and then a second moved in until eventually the entire main street was full of antique shops. The proximity of these shops next to each other supported each of the businesses as people were then encouraged to visit the area when they wanted to buy antiques. These businesses had formed in effect a memplex of businesses that supported each other. Dealers also learned (memes) from other on what the value of certain antiques were, and how to restore certain items like furniture. I myself was into antiques about 10 years ago, and I was quite surprised how little some of them knew to begin with. After a while there were too many businesses in the same area, and then they were in such intense competition with each other. This caused many of them to start closing. Some closed on and off as some of the dealer had a poor knowledge about antiques and their values and some did not have the required salesmanship memes. The antique business in Perth also underwent some change in the last 15 years. Fifteen years ago one could buy restorable furniture from public auctions at a good price but as other people discovered this, the prices started to soar, with some dealers deliberately paying more than what they could sell a piece to drive the public away. When the number of dealer attending auctions grew, they started to cut each others throats. Then someone thought of the idea of shipping over antiques from the United Kingdom. This forced a lot of the smaller local dealer



out of business. The importer suffered later when someone else started importing cheap but solid wooden from Indonesia, Australia's closest neighbour. As trends change businesses change.

Sometimes new businesses arise out of nowhere. Although it does not seem that way now, when video stores first came into being they were originally considered as quite extraordinary and perhaps a little outrageous. Not long ago we did not have to worry about insurance, now we have to insure our cars, other people's car we may hit, our houses, our belongings, against personal damage, death and so on. New opportunities are constantly arising.

If business is a competitive business, and market forces are at work, one may ask why it is that some companies develop a monopoly. This is entirely possible, and does indeed happen, as some companies position themselves to gain a monopoly by buying out smaller companies that are a threat to them. This is a natural thing that can happen and the system can evolve in this way.

Businesses that are linked in with biological instincts like sex and fear for example do well. the sex industry is an example of the former, and the insurance industry is an example of the latter. The insurance business does well because people are so scared that they may lose everything, that their lives may be destroyed. Fear is a natural biological instinct, and insurance plays on this, as does religion. It is important to note that what is feared to be lost is not just biological things but memetic things too.

With the evolution of information and knowledge, businesses and professionals need to constantly retrain themselves. For example, mechanics need to know about the latest technology in cars; insurance brokers need to more about procedures and new identified risks; roof carpenters need to learn how to build roofs out of metal instead on wood. Some businesses do not change with the times and perish, other businesses become redundant as new ideas are taken up, while other businesses split into a multitude of businesses. As and example of the later special services centers open up for car brakes, air-conditioning, and computers systems. It is difficult to ascertain whether a particular business area will grow in this way. That is what entrepreneurs endeavor to find, but if we are correct in our claim that the evolution of information is what drives the world, then businesses which involve information transfer would seem to be a particularly good bet.

### Cooperation in animals and insects

It should be pointed out that other animals and insects also cooperate for their mutual survival. Ants, insect and termites, for example, are known to work together in colonies, and they display some amazing levels of cooperation. Fire ants in the Amazon for example form a floating island when the forest is flooded. They float on an island formed by their interconnected bodies and produce the next generation of ants as they float around. Some of the ants at the bottom of this ant formed island die and are eaten by fish and happily sacrifice themselves for their colony. Ants also work together to kill another insect and save each other. I watched a group of passing ants help an ant which was trying to overpower and kill a wasp, and I have also seen ants come to the rescue of an ant which was trapped in an ant-lion's nest. In the latter, I observed passing ants make up a chain of bodies in order to reach the trapped ant at the bottom of the ant-lion's hole which is set at the angle of recluse (the maximum angle sand can be piled up at before it avalanches. What amazed me further was the fact that after saving the trapped ant another ant fell into the hole, so the ants got together to save this ant as well. This to me was an amazing act of cooperative behavior that

exceeded the need to work together to kill another insect which could be used as food for their colony and queen. It is almost as if the nats cared for each other. This example also gave me the distinct impression that these ants knew what they were doing, but as commented previously we may well just imagine this to be so because we think we have free-will and self-consciousness, which may also just be an illusion itself. Most ants and insects in colonies are however of the same genetic makup as they are born to the same queen and there is a strong biological reason why they might behave in this way, but there are also examples of other animals that behave in a cooperative way. An example of this is a group of birds that has to fly from #### to a small island in the Atlantic Ocean (#SEE CZIKO#). If these birds were to fly on their own they would not make it to the island, as each bird on its own does not have sufficient energy to make it on its own. The way that these birds make the journey is to fly in a 'v' formation with each bird in turn flying at the front to take most of the air resistance.

Many mammals care for their young to the point were they can take care of themselves. This is a few yaers for most mamals, but in the case iof elephants this can be as long as #### yaers. This is once again mainly a biological thing as these animals are generally related genetically. Furthermore when one observes these mammals taking care of tehir young one gets the dsitinct impression that these animals consciously care for their young and are not just acting out a biological scenario, but this could just be an illusion that we generate from our own perspective of what we do and experience as humans.

### Careers, fame and life after death

Another example where memes seem to dominate genes is that there are many people, with or without children, who put their careers ahead of their families. It is difficult to explain why they would do this if it was not for memes. Why do we often put our careers ahead of our families? Why is it that some people do not even want to have children? Don't they want to propagate their species. I believe that the reason is memes. Today it is more important for us to spread our memes than our genes.

Why do people want to become famous? According to meme theory, this is because once they are famous everyone will want to know what they think, about their memes. Being famous give one the capacity to spread their memes easily and distributively. Everyone wants to know what the rich and famous people think, sometimes to emulate them (so they can be rich and famous too) but mostly just because they are who they are. Fame can also improve your mating capacity and your ability to produce offspring and spread your genes, so there is as always a biological edge to all of this as well, but we believe this is of secondary importance here. Famous people also generally have to be careful with whom they sleep with because it could literally cost them millions of dollars.

Fame also has its downfall. If you become too famous, you no longer have a life of your own, but essentially become public property. You have to go out in disguise and really worry about everything you do. Exuberant fame does not allow you to enjoy your own memplex, and eventually you will do something wrong and the whole world will turn against you.

We all want to be famous, or to be liked, but this may also explain why we are often unnecessarily generous (from a genetic point of view). What survives us is our memes, as well as our genes, or children. Note that some people do not even have children, and our genes only really carry half of

our actual genes, and these dissipate quickly. Theoretically our grandchildren may not carry any of our own personal genes at all. They will of course carry those genes that we all have such as how to construct eyes, a body, a face, a heart and a brain, for example, how to digest food and fight infections. Assuming that on average our children's children have half of our own personal genes, and their children in turn carry half of our genes, then in 10 generations (about 250 years) of prodigy carry only  $(\frac{1}{2})^{10} = 1/1024^{\text{th}}$  of our genes. In 50 generations this becomes one millionth billionth of our genes. Our memes have the capacity to spread further and to last for much longer. We would like our ideas (or memes) to be remembered, in the minds of others and especially in devices with longevity such as in books, or on films. At the end of the day, when our life is over, we tend to reflect back to see what we have done, and what matters is not so much our children but what we have left behind in the form of memes. Many rich people tend to make large donations to society to leave their memetic trace behind, as they realize that they cannot take their material belongings with them when they die. They would like to be remembered. If it was not for memes, it would be difficult to explain this sort of behavior.

At the end of the day, when our life is over, one can reflect back to see what we were worth, and what matters, all that really matters is what memes we have left behind. Material things, unless they are something unusual or substantial, do not matter. Our lives is a quest to find as many memes as possible and this also makes up our identity, and our self-esteem. We strive to pass on as many memes as possible and to participate in the human quest to explore and propagate memes.

## Professionalism

With the increasing complexity of society we have to become more and more professional. Many companies need to hire accountants (with the introduction of more complicated tax laws), lawyers (with the increasing level of litigation), consultants (to advise them in areas they have little expertise in), advertising agents (to advertise their business for them). Many companies are now also instigating procedures to settle disputes and lay down the law in a much more complicated world, as well as trying to improve the productivity and professionalism.

A few years ago, Australian Football League (AFL) teams, did not even have a coach proper. The coaching was done by the captain of the team. Today, not only do we have a coach, but also a specialized ruck coach, a defense coach, a goal scoring coach, and a fitness coach. Each football team also has a host of other professional people, such as a Chief Executive Officer (CEO), a president, a media spokesperson, a marketing manager, and so on. This is a general trend also in cricket, where teams now have a coach proper, a fielding coach, a batting coach, a catching coach, and a catching coach. In the future if cricket authorities stick with the complicated Duckworth-Lewis system to set target for rain affected one-day cricket matches each team will also need a mathematical expert to advise them on tactics. This trend applies in most sports and is set to continue as the world becomes more and more complicated, as it evolves memetically.

## Financial systems

In order to survive in human society we need to provide a service for others, so that we can utilize their services in return. Monetary systems were invented so that we can function in this way, because otherwise it is unlikely that we may be of use to a particular trades person at a time when we may need them, if at all. One could argue

that memes benefit from the invention of money and hence money was invented by memetic evolution. Originally the Romans use to pay people with salt, which was highly valued as it could be used to preserve meat (hence the word salary), but as time went by this system of payment was replaced with coins, and then notes and eventually credit cards..The financial system hence evolved through ideas exchanged between humans until it has become what it is today. The advent of money has allowed us to specialize in specific areas of occupation as it has become too complicated for anyone to deal with everything by themselves. We can use money to exchange services and trades (which are just memes) with others. Money has also allowed us to work in occupations that are just information oriented, like advertising, data collection and distribution, advisor services and scientific endeavors. All of these things aid the spread of memes. In addition money encourages creativity and new ideas. New ideas are rewarded financially and this in turn allows the recipients to buy other meme services.

The reason we seek money is that it enables us to buy goods and services. that is it improves our meme buying capabilities. Money can't buy you love, but it can buy you meme services. At the end of our lives however money becomes less important, other than leaving enough for our children, and what we would like to do is leave our memes behind in some way. This we do through our children and through fame. This is why many rich people start to donate large sums of money to charity, universities, and public works. They want to be remembered. Money serve them little purpose. As they say you cannot take it with you. Money was useful when they were alive to buy memes.

The stock market is a means whereby individuals and companies can buy a share of large companies, and in doing this the large companies have capitol to expand and develop their business further. Shares have a certain value which is set by the worth of a company as well as what shareholders and potential buyers value them to be. The only problem is that most decisions to buy or sell shares is based on what everyone else is doing, which is driven by fear and greed. These are the only real driving factors of the stock market. Information plays an important part in this system. If you know something (such as some company is about to make an announcement) you can use this information to buy or sell shares to make a profit. The human psyche is however also driven by what other people are doing. People tend to buy shares in a particular company when everyone else is buying those shares. They copy each other or the majority. This also tends to drive the value of those shares up, initially in any case. The same principle in reverse applies to selling shares and falling markets. So in a sense, people copy each other when it comes to the stock market. This is not to say however that there cannot be many competing psychologies present at the same time. Another group of people may believe that it is best to buy shares when it is falling, or has fallen for awhile. Nevertheless copying, that is memes play an important part in the stock market and information (which is just memes again) is crucial. In order to do well in the stock market it is important that we get information quickly and act to it quickly as well. With the advent of the

Internet almost everyone (well not quite everyone) gets information quickly so the edge now becomes those who get it quicker than others, or those who are able to see trends before they even start. There are a number of researchers around the world who are trying to do precisely this. If we were able to predict human sentiment we would be able to predict the stock market, but as human sentiment rides on the human collective, which rides on information then that is the key to predicting the stock market.

One of the most important driving forces in the stock market is to follow the rest. If a sell-off starts, then other people generally follow suit, and if a stock starts to go up others usually join the jump on the wagon. There does not have to be a fundamental or logical reason for this to happen. Once the market moves it develops its own momentum that propels it further. We all know that the stock market is largely driven by fear and greed, and the best strategy is to follow others, but as noted the problem with this is that it tends to affect the market in an opposite way as it tries to compensate for any action. After the market has dropped enough there are usually bargain hunters waiting to make a quick profit by buying undervalued stock. This generally starts to push the market back up again. How people interact with each other and how quickly information is transmitted, assimilated and acted upon are important factors in understanding the stock market. There is also a collective aspect to this that needs to be understood. This is probably also why it is so notoriously difficult to model the stock market and predict the main turning points, that is because one of the main force involved involves psychological and memetic factors and these are difficult to model. Dr Ben Goertzel from Webmind Inc. ('Digital Intuition',#####) is however trying to model this very situation.

[This knowledge has given me extra enthusiasm for lecturing. I am not just teaching students, but I am transmitting my memes, the mathematics I know about, the little tricks one needs to solve problems, as well as my own ideas, beliefs, and life experiences.]

## **11. Sociomemeology: Why we act the way we do**

Most of what we do does not seem to have any logical biological purpose. Why do we help others, why do we do esoteric things like mathematics, why we work so hard, why we sometimes put our careers ahead of our families, and why we are so bent on copying others without thinking about what we are actually doing. We will suggest below that memes are capable of explaining many of these things as well as some of our social behavior.

### We copy like crazy

There is no question that we copy other people. Often we copy useful memes off them, such as a better way to cook meat barbecue style, a better way to keep our homes cool (air conditioning), etc. We even copy ridiculous memes, just to keep up with the Jones' so to speak. Why is it so important to us to copy the same haircuts and the way we dress from others. Why do young people copy fashions? According to memetics, we copy for the sake of copying. The staunch biologist may suggest, we need to so that we remain attractive to the opposite sex. The situation is akin, but at a higher level, to why female peacocks are attracted to males with beautifully colored tails. However there are some things we copy that do not seem to have any biological purpose, as we have already seen.

As noted earlier language is copied or leant from others, but in addition to this we copy accents, slang and phrases from people as well. Our copying capacity is so apparent that children play act copying their parents and elders, repeating what they just said and acting out their very actions, sometimes embarrassing their parents by repeating something about someone.

If you have never noticed, next time you are in a place where people can see each other have a look at how much they observe each other. I was fortunate to observe this on a train. About ten or so people around were closely observing the gentleman next to me as he was adjusting his walkman and headphones. I also noticed that many of them were watching me as I was writing this note on a piece of paper to record later into my book. I was absolutely astonished at the level of observation. You will also notice from time to time how people look other people over to see what they are wearing, and they are a bit inconspicuous in eavesdropping.

Certain groups or gangs develop memes that belong specifically to them. For example skin-heads shave their heads and wear jockey straps and big boots, and some doctors (particularly specialists) wear a bow tie. Gothics copy the way they dress and dye their hair a pitch-black color. In order to join a gang one must accept to a certain extent the traditions and customs of that gang (which incidentally evolve and can be changed). One has to give up some of their individuality, but by the same token they are also developing their individuality in a sense at the same time, because the plasticity and endless evolution of the brain.

To have friends, you also have to some extent become like them, and they like you as well. You get into a copying situation, as opposed to a creative situation.

People are constantly comparing themselves to others around them. Copying is an easy way to keep up with the rest. Copying is a much easier way to live than to have to be creative all of the

time.

Why do young people drink so much. According to memetics, they do so because they just copy others, and drink tends to relax them so that they can socialize, or exchange memes. By the same token the biologist would suggest that this allows them to meet a potential partner, with whom they can produce offspring, but this would not explain why older people need to drink. Indeed, if reproducing was a primary goal, then why don't we just have lots of children with as many people as possible. Why do we need to socialize at all. Most animals do just that. Why do we need to be so picky with whom we go with? The female of course would like to be with a male who will stick by her, as she must rear the child, whereas the male is fundamentally different in that if there were no laws, he would try to impregnate as many females as possible. I would suggest that we are picky, also because we would like to be with someone whose memes are compatible with our own.

About 40 years ago it was popular for example to take one's teeth out and replace them with false teeth. This was a crazy thing to do, removing one's biological evolved tools for eat efficiently, but at the time it was popular because everyone was doing it and people just copied each other.

As noted earlier, mobile phones are instruments that help the spread of memes. They make us readily available for conversation with other people, but memes also explain why our children all want to have a mobile phone, not just because it increases their prospects of chatting to other people. If their friends have a mobile phone they also want one just because they have one, and after a while almost everyone has to have one.

We copy haircuts and clothes fashions. We copy for the sake of copying, but if we do not copy other people we look unusual and out of place. You would look funny if you wore tight silky shirts and flared jeans, which were popular in the 1970s, now, for example. Mind you some of these fashion are coming back into trend now. One that particularly makes me giggle is the wearing of singlets by young boys. In my days my mother was always trying to get me to wear one of these things under my shirt, but it is now popular for boys to wear them exposed. They justify this trend by calling them 'wife beaters'. The other thing about fashion is that you are also generally restricted to wear whatever is available in the stores, and this is determined by the majority prevalent taste of the day. Some stores are of course selling new items in an effort to find something else that may become popular. This may make them extremely wealthy if it becomes fashionable. So in effect, like most other things evolving around us, we go mainly with the majority opinion, with a few people generating mutation through their creativity.

Another very fashionable thing to do at the moment is to wear designer-labeled clothes and clothes that mention well known companies, like Coca-Cola, Nike and Puma. This serves as a fashion statement (we want to be like others) and at the same time as an advertisement for these companies, so in this sense serve a double purpose memetically.

We also have to copy what others are doing. If we do not adopt the latest hairstyles in some way we will look odd and we will not be liked. the same applies to the way we dress, act and with our political beliefs. Sports also have to copy each other. For example, as soon as Frosby (#FUL NAME#) invented the Frosby flip where one does the high jump by jumping backwards, everyone had to follow suit if they wanted to be a high jumper, as this method gave one an increased capacity to jump higher. As soon as one football team (referring to Australian football here) became

physically strong, every other team had to do the same, and as soon as someone started using a solid wheel or a aerodynamic helmet everyone else had to follow suit. As we saw earlier the same is true in the world of business. Once a company does something which catches on, every other company has to follow suit to remain in business. One cannot help but notice that companies copy each other, particularly since they are all trying to find that elusive meme that will catch on. Chocolate companies for example all seem to bring out the same varieties of chocolates around about the same time as each other. They would hate to lose that competitive edge.

Not only do we copy at the individual level but we also copy at the business/company level and at the national level. Admittedly people/brains are involved with this too but now there are groups, or a collective behavior, involved, and decisions are made collectively.

Incidentally, one of the reasons why 'reverse psychology' seems to work may have something to do with the fact that we like to copy. When someone says, "don't look at that", or "don't do that", we are more inclined to do it because we are more adept at copying and doing things than not doing them.

Another place where copying is demonstrated in a more frightening way, is with murders and the like. When Martin Bryant killed all those people in Port Arthur in Tasmania, and this was heavily publicized on television, there was a spate of similar mass killing all over the world, in England and particular in America at schools. Each of these subsequently lead to more such events, until the novelty wore off as it were. The same thing happens with serial murderers. It often happens that someone copies them. This is one of the reasons why police often do not report the full details of murders and suicides.

We copy what other people think and what we see on television and the media.

We copy how other people act, mainly from our parents, family and friends.

Incidentally it is safest to copy the rest and fit in with the world. As we have seen previously, the act of being creative can lead to a very tormented life, with many people going against you, for being different, and the rejection that one normally expects with being creative. It is so much easier to be a sheep.

### Things we do for others

We freely tell people things that would offer us a biological (and memetic, for that matter) advantage. Why do we do this? We freely tell people how to do things, how to improve their lives and how to improve their chances of survival biologically and memetically. Why do we help others so much? We donate services and money to those in need. In terms of biology, although it may seem odd that we do this, because our genes are in competition with each other, it may be that we recognise that these people who we do help are not really a threat to us, and that there is an underlying understanding between humans to act collectively for the survival of the human race. But another, more plausible explanation may be that we help others so that we get recognised, and then our memes and ideas are more readily spread and accepted by others. Even so there are things that we do that do not even have a memetic reason.



The other day for example, I let a driver turn in front of me when I clearly had the right of way. I felt good about doing this but what is the genetic (or memetic) advantage for me to do such a thing. The person could see me as altruistic and could tell others people they would do me favours (genetic or memetic) or they could like me and listen to my memes (memetic advantage). On the other hand, neither of these is a real possibility in this case because I will almost certainly never see this guy again and even if I did I am not sure I would recognise him. The answer may be in the spreading of the meme to be courteous to other drivers and this may (may be just as long shot as the others) get back to me from others being courteous. This is probably not as unlikely as it seems as I am also following someone else's lead by being courteous, and the system as a whole could suddenly emerge with this pseudo-attractor state where people are generally more courteous. The other possibility is that I did this for myself, for my own state of mind, to make myself feel better.

### The basis of psychological behavior

We copy each other so much that we even copy things that are (apparently) inherently useless, such as the way we dress, how we style our hair, and the way that we think and act. One of the reasons we may do this is because we may subconsciously fear that if we do not copy something that other people are doing we may miss out on something that may be important for our survival. Originally this would have been mainly concerned with our biological survival but in more recent times our memetic survival has come into play.

As cruel as it may sound, most people are idiots, who just go around copying each other. (Of course if you are reading this book you are not an idiot, so please do not take offense.) Many do not even think about what they are doing, they copy their friends and relatives, and are heavily influenced by others, including what they see on television and in newspapers. Just listen to them talking sometime. Many just repeat exactly what they have heard somewhere else. Sometimes it's like listening to the news again. Most people do not have an original thought in their lifetime, very few think about things, few are inquisitive, few make any real contribution to the world. Some do not even know they have a brain, and don't believe you that their mind is in the brain itself. Many others believe things that are quite frankly untrue, like religion. Most people just go about their lives, with all of these marvelous inventions being invented for them. You may ask why do these other people do that. They do it to gain fame and to make money so that they can buy themselves more meme services, and it makes sense to let as many others as possible have your invention as this will make you more money and give you more fame.

Because we largely copy what we see around us, the memetic environment shapes the minds of individuals. In other words the mind evolves to fit in with the world around it.

As Blackmore points out some of our esoteric behaviours involving sex, fighting, food and foraging (the four F's of biology) have a biological basis, and so get a head start in the world of memes, but

biology cannot explain why we go so far with some of these activities, for example why do we masturbate or engage in bondage. She argues that this can be explained because after a while memetic evolution has started imprinted its own desires. Other behaviours that are closely related to these basic animal survival functions, such as hunting, fishing gardening and sport also receive an added boost, and this may explain why we spend so much time doing some of these things. Note that even, esotretic chess may be placed in the category of battle, competition and fighting.

Children love to learn. You often see them asking their parents to tell them more, to explain things to them. They have evolved to be naturally inquisitive, and I believe that memes is the underlying cause of this.

Memes can also influence our psychological state of mind. When our memse are in friction with other memes around us we become sad,; when they are flourishing we are happy; and when our memes are finding it very difficult to cope with what is going on around us (other memes) we become depressed.

Why do people take drugs? One of the main reasons is to escape from reality, or the memetic world; so it can also be argued that memes are the basis of drug addiction, and furthermore people peddle drugs to make money, which as we have seen is important to buy meme services. And people also take drugs because other people around them are taking drugs, or in other words, they copy others; they copy their peers. Once someone becomes addicted they take drugs, of course, not just for the reasons above. This is when chemical changes start to take place in the brain, but even then some people need to take drugs to escape to this other reality they have created.

## Conditioning

We are heavily conditioned by society, and what other people think. There is a logical reason for this. Our brain is largely developed after we are born, through the interaction with others. Most of our beliefs are formed from listening to others, that is human nature, and has an underlying basis in meme theory: we like to copy. This is also one of the main reasons why we seek approval from others for our happiness.

In search of the truth

The meaning of life

The spiritual self

The evolution of memes has helped to develop the human mind so that it can explore memes, and one of the consequences of this is that we are very inquisitive and seek to understand why things are as they are. This is why science exists. Without memes, it would be difficult to explain why we are so interested in science. Our biological survival may be enhanced by understanding the world around us, but there are some branches of sciences which are quite esoteric.

Our special mental capabilities has also lead us think that we are somehow special, in the eyes of God, and this in turn to ask questions why we are here, and what the purpose of life is. Our

inability to understand some of these questions has driven many people to religion, even though it is riddled with fallacies, as it tries to provide answers. It is ironic that religion is just a meme, but on the other hands it is the evolution of memes which is responsible for our social, psychological and spiritual beings.

If the self is an illusion as science seems to suggest then we are just acting out different scenarios as they arise without any planning whatsoever. By this we mean that our actions are already determined by our neural software, and we somehow map the situation backwards in our minds so that we feel that we are actually make conscious decisions. One of the reasons we believe that there is a God is because we imagine that there is a self inside us. If we could accept that there is no self there is no need for a spiritual self. Religion is a hoax, it is based on false statements that are changed from time to time to fit in with new discoveries with science. The only reason it propagates so well, and remains intact is that it is tied in with fear, as we have argued previously. The stories associated with the bible are also powerful and capture the imagination of children and parents like to pass on these stories because there is some good to them. They teach children what is right and wrong and how to live with other people. If people realized that there is no self and no spirituality there would be no need for religion.

#### The basis of social behavior

If the self is just a memeplex, or a collection of memes, and there is no free will, then the way we act is in essence controlled by the evolution and competition of memes. And when people are agreeing and arguing all they are doing is adding to the competition, conglomeration and evolution of memes. These exchanges are what makes society what it is. People are just vehicles for the evolution of memes and almost all of our social behavior can be understood in terms of this evolution.

Why do we so freely adhere to certain rules, morals and traditions? For example why do we all celebrate Christmas by buying presents for each other (incidentally this tradition only started a few hundred yaers ago, and was instigated by wealthy shop owners in a bid to get us to buy more), why do we go along with certain protocols, such as the way we are supposed to use our knives and forks and the why do we bow to government dignitaries. The reason is that we like to copy, we have developed with this and because of this, and there are of course certain advantages in adhering to rules and laws as it makes our own lives better and easier to live. But this does not just refer to our biological existence but also to our memetic existence as well.

#### Why do we talk so much

People talk a lot to each other. This seems to defy biological reasoning to some extent. Why do we share almost all of our knowledge so freely with others? One can appreciate why we might want to listen to others, as they might provide us with valuable information that is important to our biological (and memetic) survival. When we tell people things we are essentially telling them things that reduces our chances of biological (and memetic) survival.

We might talk a lot to other people because there is some advantage to being cooperative with others, but once again the level of communication is far exceeds any reasonable level of

cooperation. The obvious answer, to me, is that we talk to each other so much because we subconsciously want to spread memes, and remember we are just memplexes ourselves, acting out our part of memetic evolution. We would like to propagate our memes as much as possible. And if we look at the sort of things we talk about, many nonsense and gossip, then it also points to the conclusion that we talk for the sake of talking. One theory has it that we evolved to have language because we can use language to warn each other, and we gossip because then we will know something about someone else to prepare ourselves for when we do meet them. I do not find this explanation as convincing because we talk about nonsense most of the time, and what biological reason could we have to prepare ourselves against other people. There may of course be a memetic reason of why we might want to know about other people because it is now a memetic world and this includes our psychological attributes as we are nothing but memplexes. One could broaden this theory somewhat and suggest that we talk to develop our own psychological state, not necessarily related to others, but when we talk about a psychological state we are really talking memes yet again. And preparing ourselves psychologically means that we are preapring ourselves for the memetic world around us, which includes the interaction with others.

As mentioned earlier biological survival is not all that is important now, as we also need to survive in a memetic world, and the knowledge of this has lead some people to hold back on certain information, information that may be pertinent to their memetic survival, such as a skill that enables them to make a living in this memetic world. We would be foolish to tell everyone everything we know about our memes or skills that provide us with a living for example, however it seems that some people are still prepared to give away some of these memes as well. Much information is regularly published on the Internet that would be considered to be private. As we suggested earlier the self would seem to just be a large memplex of memes which we have acquired over our lifetime. So there we are, memplexes going around chatting to other people transmitting as much information as is reasonably possible, expressing their beliefs and ideas quite freely. One could also argue that this is the purpose of the self, or the purpose of life, with the limitations that we need to preserve certain memes to secure our livelihood.

### Chat room addictions

Many people become addicted to chat room discussion son the Internet. Most of these people, but not all go onto these Internet sites, because they cannot normally find enough friends to talk with, and they can also have discussions on the Internet that they would not normally be able to. Big beautiful women seem to love the Internet, as they may normally have difficulty finding male friends in the real world they can have the sort of discussions they do on the Internet. This is because most people judge them by their appearance and do not talk to them. This is incidentally one of the reasons many of these women get quite offended if you ask them for a photograph.

On the question of chat engines, why do people become addicted to them? We become addicted to drugs, like heroine and nicotine because these drugs make chemical changes in our brains, that link their use with pleasure and pleasurable memories. Can chatting be a similar type of addiction? It would seem unlikely to me that chatting changes the brain's chemistry in some profound way, but it is certainly linked with pleasure, but why is it pleasurable to us to chat about nothing in particular. We must have evolved, for some reason to enjoy chatting to other people, and memes provides an obvious reason for this again.

### Your opinion

If we are just a memeplex of ideas and things we have acquired over our lifetime, then it stands to reason that much of our thoughts and beliefs are heavily influenced by what we have heard from other people, particularly what we see on television, read in newspaper and hear on the radio. I have lost count how many times I have spoken to someone about something and all they do is repeat what they heard on television the night before, sometimes word for word. This is not to suggest that we are all zombies, as some people do think about things deeply, but I would suggest that the majority are happy to accept whatever they are told on 'authoritative' programs. This is a part of our natural copying instinct which has been developed for the benefit of memes, and these people are simply spreading the memes they heard the night before.

## Pleasure

We like to go out with other people and talk to other people and laugh. Why is that? One obvious answer is to say that we do these things because they bring us pleasure, but what is pleasure? (Actually much of what we do is for our pleasure as we feel rewarded if it is pleasurable.) Clearly some aspects of pleasure (and pain - the complement of pleasure) has a biological side to it because that way we would think that gives us a biological advantage to survive, but in this case we are talking about talking, which is a memetic thing, so to suggest that we do these things because of pleasure is really to suggest that we do them for a memetic form of pleasure. It is rather obvious that the pleasure-pain system can have a memetic basis to it, in addition to the biological side of things. As we develop mentally we start to distinguish between these two and learn to do pleasurable things. This suggests that they are not necessarily just innate or instinctual behaviors. Some aspects of pleasure and pain, particularly those associated with our psychological state of mind, are learnt through experience, they are memetic. There are many things that give us pleasure like making money, buying nice clothes or a nice (sports) car that have a large memetic component.

I would also surmise that pain is a more primitive instinctual behaviour than pleasure, and that pleasure is hence more memetic. I would also surmise that many of our emotions like grief, sorrow, regret, etceteras are things that we develop from birth and are not there to begin with. Some of these behaviors may have a biological side to them, and one may suggest that this is why the brain evolved in the first place to even have these experiences, but there are many aspects of these emotions that are developed and tuned after birth.

Another argument in favor of this view is that everyone does not perceive the same situation in the same way. Masochists for example enjoy body pain, and someone may find something quite horrendous (like child pornography) which may appear quite appealing to someone else (like a child molester). Someone else may enjoy driving fast in a car whereas someone else may find the same experience quite frightening. As motor vehicles are fairly recent inventions, short on an evolutionary scale, we could not have evolved to like or dislike this type of behavior biologically. So back to the question of why we like to socialize and in particular laugh, I would suggest that much of this is related to spreading memes, as even pleasure has a large memetic basis to it. Note that if you were to suggest that it makes 'us' feel better then an analysis of that statement would also lead back to memes. If the self is just a collection of memes then the statement that it makes us feel better is really to suggest that whatever is happening around us is compatible with our own memes.

Laughter is something that makes us feel better, which means that whatever it is that made us laugh, or gave us pleasure, is more compatible with our own memes.

To return to something we were discussing before. What makes a woman decide which male she would like to spend most of her time/life with. She wants to choose a partner who would take care of her and her children, but since many 'married' couples now choose not to have any children this suggests that there is a strong memetic reason for choosing one's partner.

Why do we show off? We show 'off' information and this is just memes. In this way we are spreading our memes when we have other people's attention. We may also want to show people what we have so that they envy us. This may make them like us, but if we cross the line and show off too much then they may not like us. .

We act in a social and responsible manner. If it was not for memes (laws and morals) we might be all going around stealing and fighting, and women would not be safe from the sexually stimulated man.

Two basic types of people

We suggest that there are two basic types of people. People who are content to copy others and accept what society thinks, and people who like to question and change the world as much as possible. As Bob Dylan says in his song George Jackson: "Some of us are prisoners, the rest of us are guards". There are of course lots of people in between these two extremes, and from time to time we may even go from one extreme to another. We call the first group of people copiers. They are happy to accept things as they are, and they apply rules and laws without question. Administrators and law-enforcement agents belong to this category, but most people in society are like this too, and there is of course a good memetical reason why this is so. We evolved to imitate each other, and this is a safer position to take in society. It is easier to fit in with the rest, and to a certain extent we all have to fit in with society to some extent. If you belong to a large group they will more than likely listen to you, except you will just be telling them what they want to hear, most probably what you all believe in. Many people who belong to this category have a negative opinion of creativity, and put down creative people, either because they are jealous (they know they are not creative themselves) or because they do not understand the importance of creativity in the scheme of things. People who are creative usually have trouble getting heard, unless they become famous, but in any case creative people make a more valuable contribution to memetic evolution than people who just copy and go with the crowd.

A slight negativity to creativity and change helps stem the uncontrollable variation in memes, and keeps the mutational aspects of memetic evolution in check.

why things happen

Memes may have something to say about fate, and why things happen to us as they do. We are referring of course to social fate and not biological or physical fate. Some things that happen to us socially happens for some reason. We may say something or do something that comes back to haunt or reward us, or we may act on something subconsciously. We may be affected by someone whom we know, which means a person we have exchanged memes with, or we may just hear something. or something happen to us that determines what we do the next day or after.

As an example of this, I was sitting in a café drinking a coffee one day. I asked a woman next to me for the time and we started talking. She asked me where I got my tan from, to which I replied Cottesloe beach (a beach in Perth). Two days later I was sitting on the beach and I noticed that she was there with her husband. Obviously what we spoke about influenced her into deciding to go to the beach. As I pointed out earlier, our ideas are based on memories which are already stored in the brain, in the form of spurious memories. We can only think about things that are in essence already inside our brains. We sometimes think we come up with ideas out of the blue as it were, but if we think about it there was something in what we did that triggered our thought and our decision to do something.

Biological effects are generally less important to our daily lives, as they evolve on a much longer time scale than what memes do. Nevertheless our basic biological instincts, like sex drive, emotions, and the desire to survive play an important part in the way we act, and this can affect us in a substantial way. Our fate is also driven by the bigger social, financial and legal scene. We are part of a complex society, that we have adapted to and have become part of as we have grown up. We are effectively each just some subset of the total memes available. There is little in our heads which we have not acquired from others. Our fate is then determined by how we fit into this society and its laws. This is why we try to raise our children, giving them all of the right memes, so that they become responsible adults who respect others, fit into society, and make a contribution to the bigger picture. People who are not properly educated in this regard usually turn out to act in criminal ways. Other evolving memes, like changes in the law, changes in the financial and political systems, or in our professional work environment have an enormous effect on our daily lives. The way that we interact with other people (or memplexes) is also crucial to our survival biologically and memetically. We may say the wrong thing to a thug, who may kill us, or we may say or do something that destroys our reputation, and then no-one will want to know about our memes. A classic example of this is the entrepreneur Alan Bond, who was a hero in Australia because he was so successful financially and he was also responsible for winning the America's Cup for the US after 138 years. Everyone wanted to do business with him, he seemed to have the Mitis touch, but once he committed a corporate fraud, no one particularly wants to do business with him and there are also people who are out to get him, some because he affected their lives.

The transmission and evolution of memes are responsible for why things happen. We often say that something just happened for no reason calling it fate, sometimes this is true, but in most cases as we pointed out above things happen for a memetic reason.

fulfillment

What is it that we seek to gain fulfillment with our lives? Some people need to spread their knowledge to as many others as possible, they want to be in the public spot light (and be famous), whereas some are happy just to be like the rest, and others seek inner peace and retreat from society. Our happiness, and almost everything else about us, is conditioned by society and our interaction with others. Whatever happiness is, it may mean something quite different to different people. People who want to be famous are really seeking on ways to spread their memes as effectively as

possible. Others who recluse tend to make contributions to humanity through their ideas, memes. Some people however, seem to separate themselves almost exclusively from the world around them, like monks who live in isolation in monasteries. Why would they want to do this? Why don't they want to propagate their memes. The answer to this may have something to do with the fact that although they are separated from the world at large, they still have close contact with other monks who hold similar beliefs to them. Ultimately we want to be liked by others. Some want to be liked by many others, while some are happy to have a small circle of close friends around them who respect, or have similar memes to themselves.

Another aspect of happiness is that it generally comes from within, an inner peace. This means that we are compatible with your own set of memes and beliefs, that whatever we belief in is self-consistent, or that they reflect positively upon themselves.

As we have seen religion is a meme which spreads because it is closely linked with the fear of death and eternal happiness after death. To many people religion gives them a sense of purpose of existence, but memes per se offers an alternative and more realistic purpose of existence. We exist in order to spread our memes, and to immortalize our beliefs and ideas.

### A busy life

We all seem to lead very busy lives. The world is complicated memetically and there seems to be more and more for us to do. When something new is invented, like a dishwasher or washing machine it may make our it easier for us to wash our dishes and clothes, but we invariably have something else to do. A hundred years ago people use to do their own washing by hand, and even make their own milk, but we seem to have no more time on our habds now that we have all of these gadgets and people to do things for us like milk the cows, or bake our bread. We of course have to do things that did not exist in those days, such as organise the repair of all of our gadgets (including say our motor vehicle, our airconditioner), we have to pay our bills, worry about our children's education, pay our taxes (and fill in those horrible tax returns each year, or just send the stuff off to the accountant), we have to be involved with the world around us. And when email was invented, did it make life any easier for us. The answer is no. We now have to respond to our letters as well as our emails, and in many cases hard copies are required as well as electronic copies. A lot of what we do is also self-generated. Why do we do this to ourselves? We do have to make a living of course, but many of us get involved in other things like sport, yoga, going to the gym, going to the movies, going out for dinner, learning to play a musical instrument, reading, taking part in political marches, socializing, collecting stamps, playing games on the Internet, or whatever. Even in recreation we seem to be involving ourselves with so many things that we did not have to do before. We are constantly trying to fill our lives with more and more things to do, and if we



find any time spare we find something else to do. memetics has a logical answer to this, in that before we did things like gather water and milk the cows because these were essential for our (biological) survival, but now we do things to survive in a memetic world, to spread our memes, learn about new memes and make ourselves feel better, which is tantamount to saying that we seek to stimulate the memes that exist within us.

It is not just ourselves that make our lives busy, as lots of other people, who are also trying to spread memes, are constantly coming at us, seeking our attention with regard to things (memes) that they consider to be important.

A friend of mine makes a lot of money, much more than he and his family need, yet, instead of relaxing he is busy looking for new business opportunities. Why is this? He tells me that he no longer does this for the money, but what drives him is the interaction with others, the very act of making a deal. This is a memetic thing, involving the exchange of information and ideas with other people.

Another friend of mine is filthy rich. He does not have to work, but keeps his normal daytime job because he uses this job as a means to learn (new memes) and to propagate his own memes.

### gambling

Having thought very deeply about why we act the way we do, I was quite convinced that memes are able to explain most of our behaviors. One that particularly puzzled me was gambling. Why do people gamble? What do memes get out of people gambling? It seems that gambling is something people do for themselves, which would suggest that there is a selfish self involved in all of this, but this defies our assertion that there is really no self at all, that the self is just a construct and that it is really just a memplex. One should point out that biology is also at odds in explaining why people gamble. One possible explanation may go along the following lines. Originally someone invented the meme (or in normal language, came up with the idea) to gamble. This may have taken place if people wanted to get food or some other goods (for example weapons or tools) off someone else. This gambling meme may have then started to evolve where we are now gambling for no good biological or memetic reason. On the other hand, gambling does have some memetic value, in that if one sees you win, you are seen as a winner in their eyes and they look up at you as a lucky person, someone they might want to know (particularly with other gamblers) and you can then spread your memes to them. It is funny how gamblers only seem to tell you when they win, and seem to never lose. The other thing about gambling is that it is a club which some people belong to and this gives them social contact with other people with whom they may be able to spread their memes. The other thing about gambling, particularly for people who are short of money is that if they win big, this provides them with the possibility to buy more meme services, however since the wealthy also like to gamble this is not the complete picture. Why do they

gamble? Maybe it is just for their own enjoyment (memplex) or maybe it is a way to rebel for them. In any case we have mentioned above some other reasons why people may gamble.

I really do not believe that gambling has a biological basis, simply because it is a relatively new phenomenon and because it can be a very harmful thing. However it is known that gambling gives people an adrenaline rush, which may have a connection with biology in relation to fear and excitement. In my mind, however, the best description of gambling is that it is a memetic disease of the mind, a dangerous way of thinking, that has just spread from person to person.

### The global brain

There is a close analogy between society and the brain. One can think of people as being like neurons, except that they communicate to each other using memes instead of electricity and neurotransmitters as in the brain. The amazing thing about the brain is that although each neuron is just a simple device that either fires or remains quiescent, depending on the amount of excitation it receives from other neurons, some very sophisticated brain functions, like consciousness, perception, vision, and emotions emerge from this. One can ask the question as to whether the interconnected network of people also acts like a global brain in some way. This is an interesting analogy as each of us is much like a neuron. Our state of excitation, which is now much more complicated than a neuron's is generally controlled by the people around us who influence our lives. The burning question is whether somehow there is a higher level of consciousness that somehow is aware of the world as a whole or at large. Recall that we are ourselves only conscious of a small part of what our brain is doing.

## Advertising and the media industry

Businesses rely heavily on advertising (which involves memes directly), and some companies, like Nike, the sport shoe company (to begin with anyhow), are just that, based solely on advertising. They were basically developed overnight by intensive advertising campaigns, and positioned themselves at the top of the market, without much previous business experience and expertise. The way that they entered the market was to cleverly associate themselves with the tick "✓". This was a particularly interesting idea as the company was then immediately associated with goodness. One of the best means of advertising, as we shall see is to use sport stars and movie stars in your advertisements. In the case of Nike, they used the world's best golf player Tiger Woods to advertise their product. Recently Nike has decided, based on their use of Tiger Woods to advertise their shoes, to venture into the golf club market, and sell Nike golf clubs. Their name has given them an immediate avenue into this market. The company LG established itself out of nothing in much the same way. In their case LG stands for "life's good". Another interesting point about advertising (see further discussion below) is that it is beneficial to invent your own special name in business. This is because if it is unusual, others will be restricted from copying it. Some of the things people come up with are quite bizarre. If it was a common name then other could not be stopped from using it. Also if one uses an unusual name it has a chance to capture our attention, which is what advertising and the propagation of memes is all about.

A similar thing has taken place 'overnight' with football and cricket in Australia in the last 10 years. The AFL (Australian Football League) and the ACB (Australian Cricket Board) have also formed themselves out of nothing. The situation here is quite intriguing because before these 'companies' were formed there was nothing really there at all, and the people who moved in essentially took the football industry and the cricket industry for themselves, whereas the games really belonged to the public. This massive turn around in finances was also secured by intense advertising. Cricket took off in the 1980's with the rebel cricket teams who played in the World Series. This series was started by the Australian television magnate Kerry Packer, who got the whole thing off the ground by using his television station. Once these industries were developed players then started to receive huge match payments, and the authorities started to sell advertising rights to big business. Sponsors can have a logo on players shirts, they can buy the naming rights for the various stadiums that belong to the ruling authority. These authorities are now even selling the rights to broadcast their matches to television stations. With the steady income that they receive each team now has sophisticated change-room facilities and each team has a coach, a trainer, a physiotherapist and for some even a psychologist. These companies are extremely powerful organization that developed from nothing by using the television medium, but they now dictate the terms to the media and others. The reason sporting organization do well is because they (their memepletic existence) are closely linked with biology, in this case with fighting. Once they started to evolve they were always destined to take over the rest of industries around them.

It's all in the name

One of the most important factors in a business is its name. A business with a catchy name, that grabs our attention and tells us what the company does, may do well because memes propagate through human attention. A name may also define that company to the extent that that name will be in future associated solely with that company. For example, coca-cola nad nike are names reserved for thsoie companies and if anyone else thried to use those names theyw ourld be sued. This si also one of the reasons why many companies today try to find names that have not been used by other people and furthermore they seem to seek names that are deliberate misspellings of English words.

In this way this name will be associated solely with their own company. Company law does however allow some companies to use a name similar to others, as long as it does not interfere with the business of the other company, but large successful companies will buy the naming rights for various other companies associated with their name, because they don't want others to piggy back on their success, and smaller and new business would do just that if they were allowed to.

The sort of names that people use to is fashionable. At one time it was popular to use names that incorporated the word 'Australian', and at another time it was popular to use names beginning with as many A's as possible, for example 'AAA cleaning services'. These names were used because they would appear first in the yellow pages telephone directory, where many people go when they want to find a tradesman or business. At another time it was popular to use acronyms, like AMP. Such names are still popular today with AXA, ACB, ICC; and such names are also used to label other things other than company names, for example HECS and PIN. One of the latest crazes is to use names with weird spellings, such as (looking through the telephone directory and picking out a few): supa bins, toys r us, korn (with a backwards 'r' as well), clockwerk, ezy-clean, and y2k security. Companies also like to try to be trendy with names for themselves and their products, like [di@su](#) (the motor car company diahsu), which is popularized by email, and Telstra's communic8, which is popularized by mobile phone jargon. Another thing that people use are adjectives that give their company or product an elevated status, like Ford Pulsar, Nissan Proton, and Supa-Value, turbo-clean. Yet another idea is to use names for companies that portray what that company does and/or elevates them in some way, such as Floors Without Flaws, Hire Intelligence, Telstra (telecommunications company in Australia), Telecom, rugs-a-million, Comtech, Transperth, Westrail. Such conjunctions are also used in making up new worlds that eventually make it into the dictionary, such as email, Internet, website, memeplex (for meme complex), singlish (Singaporean English), faqs (standing for frequently asked questions). Another thing that is often done by businesses is to invent a symbol which then becomes their trademark on products. As an example Nike uses the tick, but this can technically be copied to a certain extent, because Nike would find it hard to argue that this symbol actually belongs to them, so long as other companies change it a little. A more common practice is to use the acronym of a company's name and somehow combine the letters together in some way. An example of this is #####. Some companies even invent more graphical symbols that they feel represents their company name or what they do. Some examples of this are shown in figure below (##).

Another tactic that is used by businesses is to invent their own names, not necessarily misspellings. Nike and Coca-Cola (or Coke) are examples of this. Bob Dylan is also such a name as well. If a company can invent its own name, that name will forever belong to them and no-one else will be able to sue it. If on the other hand the name was a fairly common word then there is nothing to stop someone else use that name or a variant of it.

Companies often sue other companies if they use the same name as them, or if it is too similar to their name. A classic example of this was when Arnott's Biscuits took Dick Smith (an Australian entrepauner and successful businessman, who want to save Australian food products from foreign ownership) to court for using the name 'tin tem" for his biscuits, whereas Arnott's had the name 'tim tam". in the end it was agreed that Dick Smith would call his product "tintem", a single word. This is a prime example of how ideas (here just words) are so important. How would we explain this sort of behavior if the world was only a biological world. I am also aware of a particular company (I won't say who they are) who set up a name after someone else had already registered that name. This compant asked this small business to change its name, because thye wanted to be the only company to have this name. They even offered him \$50,000 Australian to do this. This person refused to change the name of his company because he figured that he had come up with it first.

What this bugger company did was to take this person to court and send him to bankruptcy by running up such a big legal bill that the smaller business could no longer fund. Another example of this, is that Victoria Beckham, who is married to English soccer star David Beckham threatened to sue an English soccer club for using the name Posh because this is the name she used in a band called Spice. I have no idea what became of all of this, but the really strange thing is that the soccer club had this name before the Spice Girls even formed. It is a case of where each party believes that the name belongs to them, or can be used widely. Strange days indeed.

## Media

The media plays a prominent role in spreading memes. Most people believe what they see on television and read in the papers. This is just a reflection of their instinctive copying desires. This is why advertising works so well, why politicians like to use the media, and why it is often used as a means to spread propaganda in many countries. The latter has been particularly popular in communist countries, or countries with a dictatorship. At least that is the way it appears to us, from western 'democratic' countries, but then again we may just be brainwashed into thinking this as we are ourselves influenced into thinking like this by the more subtle propaganda we are subjected to. One wonders why for example Americans are so pro Israel in the middle-east conflict. The reason may have something to do with the fact that many of the newspapers in America are owned by Jews, and businesses who have much to gain by exploiting the third-world.

The media - newspapers, magazines, radio and television - often report what people want to hear. Stories that make the headlines are those which are deemed to be of public interest, such as success stories, hard-luck stories, bureaucratic bumbles, horrific stories, etc. The media works on the notion of grabbing your attention (that is how they spread their memes) and all the various avenues of the media are in competition with each other. If there is a big juicy story they will all report on it, but if it is a small time story (even if it is important (say in a scientific sense) they may neglect it, especially if a rival paper has already reported it. The media love reporting about what film stars and other famous people (like the royal family and sports personalities) are doing. This is because this is what we are interested in, and as we saw earlier, this is one of the reasons people get involved in these industries in the first place. People want to be famous to spread their memes, and in today's modern society being famous also means that one will be rewarded financially with sponsorship, but as we argue elsewhere, the purpose of money is one of obtaining the means to buy products and services, both of which are essentially memes.

What we see on television and in newspapers has an enormous influence on how we act. Many studies have confirmed that violence on television leads to violence in real life. This is why some violent movies and video games are banned. Not only do we become desensitized to violence but we tend to copy what we see. A few years ago, when Martin Bryant killed some 35 people with a gun in Tasmania, Australia, and this appeared on the news there were a spate of other similar killings around the world, in a school in the United Kingdom, and there a few such cases in the US. Not only do people copy for the sake of copying, but people also see that this sort of thing gains them fame through notoriety, and this is what they want to be noticed.

I myself love talking to the media. I see this as an effective way to propagate my ideas (my memes) to the masses, even though it can be very frustrating at times. I feel like I am fulfilling some purpose by doing this. This is also why I chose to write a book instead of publishing papers in scientific journals, where they are generally only read by two or three people. A book can be read by

thousand to hundreds of thousands of people.

Advertising is very influential on what we buy. Some companies like Nike do not even have any shops anywhere and produce their goods in third world countries like Indonesia, and still charge a lot for their products. Is Coca-Cola such a good drink or are we driven to drink it because of the constant brain-washing we see on television.

Good advertisements use songs, jingles, jokes and humour, catchy names and phrases, and symbols to sell product and ideas, all designed to catch our attention. If an advertisement uses a good song, that has already transmitted itself to a wide audience then this will give that product almost instant access to the audience already reached by the song previously. In this case the advertisement rides on the memetic wave already created by the song. Coca-Cola uses catchy phrases and elaborate prize winning advertisements to sell its products. Examples include "things go better with coke" and "it's the real thing", or "you need it". Some companies like Coca-Cola, Nike (shoes) and McDonalds (hamburgers) spend a lot of money on advertising and one wonders how well they would do without this detailed advertising. Nike uses the 'tick' as its symbol and uses high profile sport stars to endorse their products, paying them millions of dollars literally. MacDonalDs Mac's everything it does, like a Big Mac, a Mac chicken burger, a Mac muffin, and "Mac your day". We are constantly bombarded by their advertising and this tends to brain-wash us. People tend to think that Nike shoes are really the best even though most of their products are made in third world countries. When people get thirsty they automatically think of Coca-Cola and when they get hungry they think of MacDonalDs. We also mentioned earlier, when we were talking about consciousness that some companies used subliminal messages to enter our subconscious mind, without registering in our consciousness, to sell their products, particularly during movies. Advertisers also like to use our primitive instinctive desires, like sex, and emotions, to sell products. A powerfully emotional song does wonders to get people to donate money to a charity.

Another way to grab attention is to associate the advertising jingle with something that is already known. Today I drove past a truck that was transporting an advertising sign about a car. The jingle they used was so and so is "sexier in the city". This was obviously designed so as to be associated with the TV program "Sex in the City". I even thought about using "The Selfish gene and the Selfish Meme" (or "The Selfish Gene, The Selfish Meme, and the Selfish Self") as the title of this book as this would be immediately associated with the bestselling book by Richard Dawkins titled "The Selfish Gene". Incidentally, this same concept also applies to ideas generally. There is little benefit in coming with an idea that is too novel or too different. people will find it hard to accept. Highly creative people are often shunned by society and it takes a long time to have their ideas accepted. Ideas that take off are ideas which are closely linked with previous ideas and knowledge. There are two reasons why this is so. The world, by which I mean the memetic world, resists too much mutation, which does not benefit memetic evolution greatly. Secondly, the way that the human mind comes to accept ideas is through spurious memories, which are themselves built up from previous memories and ideas. Spurious memories are how we learn something new, so if an idea is too radical the brain is not readily equipped to accept this idea, but by the same token the brain could through excessive exposure become used to an idea which it will be able to accept at a later date. Some advertising jingles do just this. When we first see some advertisements they are completely meaningless and ineffective but as time goes by they can become effective. If you do not have millions of dollars to spend on advertising, like the big multinational companies, then the best way to spread your message is to go piggyback on something else that is already well known.

One of the best forms of advertising is by word of mouth (transfer of memes). If you like

something you will tell others who may try it themselves and tell others in turn. If you tell 10 people and they tell 10 in turn, who spread the word to 10 in turn again, then after only 6 generations of this pyramidal gossip one million people know about this good product or service. By the same token, word of mouth can really destroy a business as well. One dissatisfied customer can tell many people who in turn can tell many others and so on.

As people come up with new ideas (new memes) for advertising and selling their products (which are themselves memes), others have to copy suit or they will be left behind. We saw earlier that businesses which do not keep changing, to incorporate changes taking place around them will not survive. The same is true with advertising. You may notice that carpet businesses all invariably have to have a liquidation sale now to sell any carpets. This is certainly the case in Perth, Australia. Once someone came up with the bright (or not so bright) idea that they would pretend that they are closing shop or have to rapidly sell their product, the other carpet businesses have to follow suit, because people will then just wait for one of these special sell-offs to occur before they buy carpet. The idea seemed to me to come from an astute Pakistani or Afghanistani businessman in Perth. He was probably used to bartering heavily in his own country and thought he would adopt a large discount, which is generally offered to people as a trick to sell his product. Incidentally some carpet places offer up to 90% off marked prices with an additional 5% for cash. You could find yourself paying \$100 for a carpet normally marked as \$2000. You would feel rather sick if you had paid the full price for one of these carpets. It is difficult how this system may evolve next. Maybe someone will just offer the carpets at the reduced prices without any fabricated discounts. Another interesting point to note about this example is that once the idea to offer large discounts has been adopted by all carpet places, its particular usefulness to its inventor, and those that followed shortly afterwards, is lost. This example also serves to demonstrate that if businesses do not copy each other, they may not survive at all in the changing world around them. It is also difficult to predict why this meme trick was used so successfully in this case and why it should not work for other products. Maybe carpets were previously heavily overpriced.

The same is true for other businesses. Once someone from a particular type of trade starts to use a particular idea in advertising, the rest have to follow suit. The same is true of products. For example if a chocolate company starts to make a new chocolate with large amounts of peanuts, or dark chocolate with peppermint, others will quickly follow suit. They even copy the colours on the packets and the "new" symbols. Frying pan companies had to all start using teflon to coat their frying pans. Once a chewy company makes a particular flavor of chewies or shape, the others have to make them too. Many companies have to follow these trends or they will be left behind, particularly if this new product or idea kicks off, and since it is difficult to predict what will work, it is hardly worth taking the risk and not copying the others. In most cases what makes something successful is advertising and not so much whether or not it is actually useful. Once something becomes popular it is "off" and everyone else has to copy and follow suit.

Most main stores in your vicinity undoubtedly send you catalogues telling you about specials in their stores over the coming week. In fact it is hard for me to think of any major stores that are around me that do not send out this form of junk mail. The point is that once one of these places starts to send out this sort of advertising the rest have to follow suit to remain in competition with the others. It is quite ironic that most of these catalogues are delivered at the same time by a common distributor.

Another crazy advertising ploy is for companies to buy shelf space from supermarkets to sell their product. The supermarket is then not only making money from the sale of the product but also from

the company itself. Companies would like to buy shelf space at eye level because then their product is more readily seen and purchased.

Another thing about advertising is that they have to be noticed. As mentioned previously a good jingle or image may help in this regard. Some will offer you free gifts if you open their mail, and some have competitions if you participate in the purchase of their product. Another idea which has been exploited recently is to make an advertisement which seems totally bizarre, often associated with humor. This draws attention to the product and if the idea becomes exceedingly popular makes the company wealthy. This advertisement or idea may then become so heavily associated with that company that people will automatically start to associate related ideas with that company and in time the company may reserve ownership of that idea. I would expect that Nike could claim that the tick belonged to them and the Orange telephone company could possibly claim that the name and color orange practically belonged to them. If someone else comes along and tries to use the tick or the color orange in a way that closely resembles these companies, they are likely to be sued.

Mobile phone companies (which are memplexes and memepletic service providers) exploit memes in a number of ways from which they profit. One of the best tricks that encourages their expanded use is to pass on the fact that someone tried to call them (with their number). This makes the receiver obliged to call that person back. Silent messages are another exploit that plays on memes as you are also obliged to take part in a SMS exchange, and mobile phone companies do well from this type of adolescent addiction.

### Crazy advertisements

Another ploy used by advertisers, to gain our attention, is to have really silly advertisements, almost to the point of absurdity. If the advertisement is outrageous it may make us wonder why they would make such an advertisement, and this in effect is effective advertising. One such advert used a Monte Python silliness to gain our attention.

### Need for expert help

Advertising has become so complicated today that we now need to hire companies to make our advertisements for us. This is an example of a new niche forming to fill a memetic need. Musicians have to hire people to help them do videos because very few singles are released without a video, and once the pop group Abba started to make videos as a regular thing, everyone had to follow suit. This opened up a new memetic industry, that everyone now has to use.

In the same way, if we want to make a media announcement it is now almost essential to use media consultants to do this for us, as they have the required memes to propagate our message for us and have contacts in the media industry to help spread the message. One of the reasons why this niche has opened up is that everyone is trying to get some message out, as we are all essentially striving to get our memes out there, whether it is for our business or ourselves.

### What's in a name



[#Look up some company names in the yellow pages to give examples of the sort of crazy names that people sue to set up a company and get our attention#] Companies also try to copy successful names of people and other companies to try to take advantage of someone else's good name. As an example MacIntosh Computers tried to call its new operating system DYLAN, after Bob Dylan perhaps. Companies also try to incorporate names of places etc, eg. Hollywood paving, and try to use successful sounding names, like 'window excellence', names that portray an image about their product, eg. Dyno, Super, Proton, Atomic, . they try to misspell names to grab our attention, crazier the better.

### An endless array of means

The means by which information is portrayed is ever increasing. There are newspapers, television, books, magazines, and the Internet to mention just a few. In the case of television there are more and more channels, with some running all night, and access available practically the world over. When the Internet came into being, one would have thought that books would have vanished from existence, but they did not. The variety of magazines has also grown enormously. The next time you go into a newsagent have a look at what is available. There are magazines on houses, gardens, cars, architecture, gossip (lots on this), almost anything imaginable. All of these means for spreading information and memes are themselves funded by memes, or advertising, which in itself is a way for a business to spread its message about itself, about the meme service they provide. Without advertising there would be no movies, no magazines, no television and no newspapers.

The other day I went to see a doctor and while in the waiting room I observed hundreds of magazines, arranged in twelve piles with about ten to twenty magazines in each pile. I had never seen some of these makes of magazines, which supports my claim above that there are so many variety of magazines. Most of these magazines were incidentally quite old. (I guess doctors get old copies from newsagent friends to put into their surgery.) Anyhow, the front pages of all of these magazines were competing for my attention. A magazine called NW (which I had never seen before) had in bold large print saying "Who hates who: Hollywood's ; latest feuds" (I did pick this one up to have a look). Then there were the following magazines and headings:

Home Beautiful (another one of those 'home this home that' magazines: "How to afford a farmhouse in France")

Hello! (another magazine I had never heard of): "Inside Elton John's amazing star-studded Oscar party" (with a picture of Elton John, Michael Douglas and Catherine Zeta-Jones)

Hello!: "Robbie Williams and Nicole Kidman: The full story of their relationship and remarkable exclusive pictures (they probably just had a few photographs taken together when they recorded their song "I love you")

Marie Claire (a woman's magazine): "Horoscope Special: men, money and sex"

Time: "target: Bin Laden" (with a full page photograph of Asama bin Laden)

Reader's Digest: "or banks: MORE FEES LESS SERVICE"

Vogue Entertainment: "ham it up! festive tables: tradition with a twist"

New Scientist: "Population Crash Looms: Boom to bust in 100 years"

New Scientist (same issue as above): "Dark Force: An outlandish power is pulling our spacecraft off course. Have we got gravity all wrong?"

All of these magazines used something to capture my attention. Some used well-known identities, like movies stars (we all want to know about, and who are the ultimate fashion memplexes), catchy headings, some stirring emotions (like love and anger against the banks), some appealed to the unknown (like anomalies in gravity), the mysterious (like the popularity of astrology), sex, beauty, money, family, fear, food, some implied innuendo, beauty, money).

in addition to these forms of advertising, there are also advertisements place on buildings, on billboards, on taxis, and on buses. The other day I spotted a bus that is usually painted green, covered in advertisements, except for the front part of the bus. I guess all busses will become like this in the future. the only part that needs to remain green is the front part so that people realize that it is a public bus. Another place where they seem to be placing ads at the moment, that makes me chuckle, is on rubbish bins. Even this humble eyesore is being targeted for advertisements. There was even talk one time of placing advertisements in the sky at night, but this was rejected. Wherever there is a possibility to make money (which remember is a means to buy meme services) there is a chance that advertising will find itself there eventually.

Advertising has gone crazy. A classic example of this is the AFL (or clubs in the competition, or companies spinning off from either of these businesses) selling the naming right of their stadiums, for amounts up to one million dollars. The 'Colonial Stadium' which was a new sporting venue built in Melbourne a few years ago, was named after Colonial Mutual Insurance, but the naming rights have recently been taken over by Telstra, the main Australian telecommunications company, and it is now called 'Telstra Dome'. The main football ground in Adelaide use to be called 'Football Park', but in the last year its name has been changed to AAMI Stadium, after another insurance company. 'Kardinia Park' in Geelong , was renamed a few years ago as Shell Stadium, after the giant oil company, but is now named 'Skilled Stadium'. The crazy need and desire to sell naming rights is extending itself to every possibility. In the West Australian Football League, the scoreboard even has a name, and every time the commentators tell you the score on the radio, they say (Bunnings is a hardware chain in West Australia), "On the Bunnings scoreboard, Perth is 10 goals 7 points, to....". Football teams usually wear a logo on their jumpers to show who their sponsors are. Even the football itself has advertising on it. At most football grounds they first sold the rights to advertise on the fences around the ground, then they decided to add boards that rotate so that you now buy advertising time on these fences. In cricket the sight-screen that players need to see the cricket ball turns into an advertising sign in between overs. They are also painting advertisements on the grassed oval, also in such a way with perspective that when they are viewed through the television camera they appear to stand up from the ground.

The crazy thing about advertising is that we are receiving memes asking us to buy certain meme products and meme services, and we are ourselves just memplexes, a collection of memes gathered over a lifetime. So it would seem that all of this is just a play played out by memes, nothing else. This is quite weird when you stop and think about what exactly is going on here.

## 12. What can we expect in the future?

Technology has been developed to serve us and to make our lives simpler to live (or has it?). The question is will it one day evolve so that we serve technology itself. Some people may argue that this has already happened.

Having determined that memes are now what make the world go round, and that genes have effectively stopped evolving, we may then conclude that the purpose of our lives is one trying to spread and develop further the evolution of memes. This is why we want to have careers, why we would like to be famous (or heard), and why the Internet has evolved. I use to joke with my friends when I was a high-school student that one day I will be so famous that I will be able to live off the sale of my sperm. How ridiculous! I was under the impression, at that age, that what matters in our lives are our genes, but I would now tell my colleagues that I would like to live comfortably by transmitting and selling my memes, not my genes, and to be remembered for my memes.

The world is very complex memetically and is evolving ever so faster. Just look at the way our lives have changed in the last 30 or 40 years. We can expect changes in the next 30 or 40 years to be even more dramatic. The only problem is that is extremely difficult to predict how things will evolve. Chaos theory tells us that there are many systems (and simple systems for that matter) where we cannot predict the future, even if we know the precise algorithmic laws governing the evolution of that system. However, it may be true that certain things are inevitable. Recently ### has suggested that the biological evolution of the human intelligence and its supremacy was a forgone certainty, convergence was the word used to describe this. And once the human race came into being with its superior intelligence it would rule and control the biological the world. We would suggest that this became inevitable once memes started to evolve. What I am trying to say here is that certain things may still be predictable in a chaotic world. There are definitely a few things we can expect from the evolution of memes. Information will be spread with greater and greater ease, businesses involved with information will continue to grow and become more important, the world will change and change again (the times they are a changing), and maybe real artificial intelligence will evolve itself, with our memetic influence.

As memes evolve, some things will make our lives easier to live, like luxuries like dishwashers and air-conditioners, but by the same token they will complicate our lives because we will need to hire people to fix them when they break. Laws and general rules for living will get more complicated and this will make our lives worse in some respects, but by the same token again, these laws will protect us from evils. The whole question of what is good and what is bad is a very philosophical one, as what we mean by good is that it fits in with other things around it and what is bad does not, but it could be bad in one respect but good in another. What is clear however is that the world is becoming an exceedingly complicated place, and this complexity is being generated as more and more spurious memories are being discovered by humans.

As we noted earlier the memes that seem to do best are those which have a biological connection, but as memes evolve new evolutionary pressures come into being. The memes which will do best in the future will be those which fit with the other memes that are in existence, but the problem is that we cannot really predict which will be around in the future. It is a bit like trying to predict what type of creatures would evolve from genetic engineering.

In the future we will want to acquire and process more and more information. Does this mean that our brain will continue to grow, as there is increased pressure to learn more and more and to be able to extract relevant meaning from a vast array of available information. If the rapid expansion of our brain was due to the ability to copy and imitate, as suggested by Blackmore, then the size of the brain should not increase dramatically. If however the size of the human brain is connected to the ability to store more information, and the ability to process such information creatively then we should expect an increase in brain-size. If storage capacity is the key driving factor then we would expect a massive increase, but if the need to generate more spurious states is the key then we might expect a smaller increase.

In the future laws will get more and more complicated. Just in the last thirty years or so, we are no longer able as teenagers to buy chemicals. I remember as a thirteen year old going to a chemical company to buy a large bag of saltpeter, some sulfur, and some charcoal so I could make gunpowder, explosives and rockets. This ability actually inspired me to do science. The sad thing is that some kids hurt themselves because they did not take the necessary precautions, or know enough about what they were doing, and the law had to change to protect them. Today we can no longer smoke inside building because some statistician found a link between passive smoking and cancer. I remember going to the theatre in England in 1980, and smoking my head off (everyone else was too). The projection rays stood out because the room was filled with smoke. In many countries we are no longer allowed to ride our bicycles without wearing a protective helmet. Teachers are no longer allowed to use corporal punishment. We can no longer able to drink and drive, or speed. In the future any mind-altering drugs will be detectable. The list goes on and on. With more statistical correlation established we will uncover more and more things that have to be outlawed. Tax laws will have to change to keep a step ahead of people who find (legal) but immoral means to avoid paying tax. The Internet has added a whole new dimension to legislation and law enforcement. We will need an enormous police service to deal with these complications, and it will living will become much more complex. We will have to deal with more things, like superannuation, taxes, criminal laws. the world is going to get much more complicated.

Science has grown at an incredible rate over the last 50 years, or so, and grows almost unabated today. The number of PhDs awarded seems to be steadily increasing and there is increasing need to find the answers to problems and fundamental questions. Politician and communities realize the importance of true knowledge and happily support science, in some countries at least. I have heard it said that 90 percent of all scientists who have ever lived are alive today.

As knowledge continues to grow and we 'need' more and more services to survive we will have to specialize and expand our vocations. In science, for example, most researchers have to work in very specialize areas. As we continue to make complicate our lives (some say to make it easier, but we need to deal with more information), we will need more and provided services. We will continue to find ways to reorganize and acquire information.

As the available information and knowledge grows, we need to be more and more qualified to survive in a complex society. About 40 years ago, most people could enter the workforce with only 10 or 12 years of schooling, but it has now become essential to go to university to become qualified enough to find employment. Even nurses need to get university degrees in Western Australia. Not so long ago, lecturers at universities did not need to have a PhD, but this has become almost essential today. My brother set up an insurance brokerage without any qualifications, but if someone wants to do that today they need to get qualifications and a license, and insurance companies need to do certain tests to maintain their license. As information grows, the laws also

change to protect people. This is why more qualifications are required. I often joke with my students that one day even a bus driver will have to get a PhD.

It is already the case today that we thrive on information. Information about something can help us with our financial success, how to save money, make money and be happy. There is a never ending desire for more and more information and one expects this grow to grow in the future, particularly with the advent of the Internet. At the moment lots of information is free, but in the future, most information (and not just trade and career knowledge) will be charge for. As the Internet business develops we can expect to pay for information from it. This has already started to happen. When the Internet first started most sites could be visited for free but once someone figured out how to charge credit cards in a secure way, hosts and service providers started to charge. This also seems to be an effective way to start off a business. Allow people to use it for free and then start charging for it when they get used to it. This is what banks did with electronic access using credit cards.

I believe that in the future we will have an information meter in front of our houses just like we have a water, gas and electricity meter. Someone will come to read how much information we have used to the last three months, and we will pay accordingly. We will, and in some cases we already are, paying for our movies we down load to watch on our televisions, for 'pay television'.

The information revolution, and in particular the Internet, is bound to continue to grow. In the space of just 15 years we have gone from emails, to webpages and advanced communication systems. Almost every company today has its own website. The growth is staggering. We have also seen the introduction of live voice and visual information on the Internet. Computers and the Internet are being introduced into most schools, and most universities around the world are developing on-line teaching in a big way. In the future we can expect to see virtual universities. The technology to integrate television, computers and communication systems (like the telephone, fax and email) is being developed today, and should be in widespread use within the next few years. There are also portable Internet devices, enabling people to access information when they are neither at work or at home. One would expect this revolution to continue unabated, and possibly accelerate in the future.

What is perhaps a little surprising at first is that electronic transmission of information has not meant that we no longer use paper or read books. In the same way videos did not kill movies. Mobile phones have not replaced landline phones, except that a few phone boxes may have disappeared. Instead what has happened is that we now have all of them, and this suits memes because they then have more avenues to propagate themselves. By the same token, the advert of all of these new sophisticated communication means has not made our lives any simpler, probably a little more complicated because most communications to use make demands on us. This reminds me of the following story. I was talking to one of my professors one day in his office and his phone rang while we were talking. He ignored the phone and kept talking to me. A few minutes later his phone rang again and he ignored it again. This happened a few times while I was in his office, so I had to ask him why he did not answer his phone. He said to me, " George, when someone rings you they generally want you to do something for them. They rarely ring to give you something." What my professor was doing was filtering his calls by not answering a lot of them. He figured that if someone really needed you they would eventually ring you back and find you eventually. The little problems or requests would go away themselves and there would be no need to deal with them.

Another thing that you will notice is that the amount of emails you receive has steadily gone up,

with just over half of the email you receive being junk mail or 'spam'. It is also apparent that many old and no longer relevant websites are not taken down. All of these things aid the longevity and spread of memes.

The future of society may become so reliant on the Internet and information that we may automate all of the other things that we need for our survival, like the production of food, consumables or products, and all we need to do is to discover and propagate memes as widely as possible. Most occupations in the future may be in these types of industries, involving information transfer, and if you are not up with it you may perish, memetically and genetically.

With the increased connectivity of the Internet, could computers around the world self-organize themselves to have intelligence and/or consciousness. We are certainly not suggesting that the Internet will develop an intelligence rivaling that of the human brain, but an intelligence nonetheless. By this we mean the ability to recognize patterns in the data, and combine them in novel ways to generate new patterns according to previous experience. Ben Goertzel, from the University of New Mexico, had the idea that he could develop such a device by connecting sufficient computers, or nodes, around the world and with a computer program get this entity to observe the news around the world in an effort to predict human sentiment. If this could be done he hoped that he may be able to predict the fluctuation of shares, which are controlled by the social psychology of humans.

There is always a tendency to think we have reached the pinnacle of our development and understanding. This is a common view held in science. At one time particle and nuclear physicists were convinced that the proton and neutron were the smallest particles making up matter only to find some 20 years later that they too are made up of smaller particles called quarks and gluons. Quarks and gluons are now thought to be made of even smaller particles, maybe even string-like object. The same is true of our thoughts about everyday discoveries that affect our lives. We have fridges, computers, washing machines, etc. What else is there that we need. We do not exactly know as these things and needs are evolving in front of us right now. There is ever reason to expect that the world we live in will be vastly different in the next 20 to 30 years to what it is today. Who would have thought that mobile phones and computers (except for Bill gates) would have had the impact they have had. The same is true of the way we act and dress. We imagine that we are living in a style that will never go out of fashion. What else could people possibly wear in the future that could be more practical and desirable? This cannot be true as we only have to look back in time to see how fashions and ideals have changed since say the 1940s, when men used to wear suits and hats and it was considered to be a honorable and worthwhile thing to go to war and fight for your country. If you even look back on some old movies or television re-runs dating back only about 10 years you will see how much we have changed in such a short time, and if we look back in 10 years time we will see how ridiculous we look today.

"city's just a jungle...more games to play" bob dylan 2001

god is in the brain of humans... a collective thing in our heads...not in heaven...it grew out of fear and lack of understanding, fear of volcanoes, fear on the moon, fear of the sun,... we worship things we fear...and religion survives out of fear...and out of lack of understanding...it is aided by the fact that there are some things we will never understand...thanks to chaos theory.

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Not all of our behaviours can be classified as evolutionary or memetic, that is to suit either the genes or the memes so to speak. Take for example the question of tobacco smoking, or drug addiction in general. This is most probably driven by a chemical addiction, to substances like nicotine, in the brain. The same may also be true of gambling, sex and love, although sex and love may have a biological angle to them, however this would be pushed to explain our level of obsession with these types of behaviour. One can also ask if love is just a meme. Love, like consciousness, is difficult to explain what exactly it is. Why would one gamble compulsively or continue to take drugs to the point of extinction.

Our lives is a quest to find as many memes as possible and this also makes up our identity, and our self-esteem. We strive to pass on as many memes as possible and to participate in the human quest to find the master meme.

## 3.4 Memes today

There are also lots of everyday things that we do that do not have any survival. For example we mow lawns; we do things around the house that do not serve any such purpose. Why do we do such things? To impress others, but why? So that we are like them and liked by them, so others envy us, so that they will copy us, or our memes. So we do it for our memes. Memes offer a natural explanation for why we do things that expend energy but serve no biological survival need. If you stop and think about it, there are many things that we do that are simply not necessary for survival. We think, we talk, we have careers, and so on.

Memes are also unlike genes, because they are not represented by a simple molecules like DNA. Memes can be combined and manipulated differently with large amounts of random variation or mutation during reproduction and storage. Memes can also be crossed-over and extended in 'length' by combining with other memes. Pieces of memes may also be thrown away or combined with other information. It is also not clear what structure meme actually take. Information does not need to be organised in a linear or molecular (DNA fashion) but may be represented by some other complex multi-dimensional structure, which may also be a fractal, crystalline, or network structure. In this case, memplexes will be giant fractal-like structures. More generally memes can probably be defined as patterns in data.

One could think of all knowledge as a giant fractal lattice structure and what we know only a certain part of it, which in this representation looks like a big group of connected fractals contained within

this larger fractal. An alternative representation may be in terms of a giant lattice, where the units are pieces of knowledge or memes. The law-memplex may consist of a collection of such pieces of knowledge, whereas the financial-memplex may consist of another collection of memes or lattice units, some in common with the law-memplex, as some laws relate to financial matters and vice versa. We could then have the moral-memplex in here too, which would for most part of it consist of similar units as the law-memplex. This can be visualized in three dimensions but is more probably in a much higher dimension. Imagine what we know (individually and collectively as humanity) is highlighted. This will obviously grow and move about with time, like electricity flowing through the knowledge fractal. Individually, we know only small snippets of the information known to man or of that which is knowable.

Genes usually undergo small amounts of variation, in fact there is error-correcting code in DNA which enables errors in transmission to be corrected. In humans, reproduction capacity is low in humans (not so in all animals and plants). Memes on the other hand can spread locally (to a few people, family, friends, work colleagues, similar work professionals) or globally (to many people). The latter, or massive transmission of memes to others, for example through the media, normally takes some sort of phase transition or critical mass to eventuate. Memes also experience much more variation in transmission compared with genes and are also manipulated by human minds.

Generally memes are useful to humans, but there are many examples where they are not. Memes associated with bizarre sexual practices, rape, cheating, stealing, hurting and murdering people are example of this. Note that memes do not have to be true either. Memes are not necessarily answerable to science. Religion serves as the classic example of a false meme that spreads, even though it is impregnated with contradictions and lies. When Dawkins first raised this awareness there was an enormous backlash, with more people turning to the Bible than ever before. In fact the Bible, after some 2000 years still tops the best selling book list year after year. The explanation for this is that there are powerful memes at work here. Although religion may be falsified, it is not necessarily useless, and one can even argue that there is a genetic advantage for humans to believe in religion. Religion gives people sense of comfort and understanding (even though it may be false) of the complex world around us, of life and death, and our souls. The Ten Commandments (thou shall not kill, thou shall not steal, etc.) are also good rules that enable the humans to coexist in societies or groups, although one could argue that inter-religious rivalry is the basis for most wars. There is the classic belief in religions that their God is the true God and others whom they would kill with any hesitation believe in the wrong God. It is surprising that religious rules, such as thou shall not kill other human being, although it is meant to apply to people of the same religion, is freely ignored when there is a war with group of another religion. This fiasco is best summarized by Bob Dylan's classic song "With God on our side".

One of the key problems with memes, as replicators is that they are easily manipulated and genetic evolution from experience with mathematical realisations of genetic algorithms, normally works best with only small amounts of mutation. Memes, or ideas, which is what they essentially are, are not always transmitted with great accuracy.

Most memes seem to have some importance in our evolution and our behaviour. Some memes spread widely and have great importance to humanity, while others are not freely spread and are mostly irrelevant. One of the classic examples of a meme that spread widely is religion. One of the main reasons why religion is so widespread is that the religion meme is combined with both fear (you will go to hell if you disbelieve) and promises, and the church actively encourages parents to



pass on the religion meme to their children. What is most surprising, as Dawkins and Blackmore note, is that religion is generally based on unfounded and illogical premises. The falsehoods of religion are generally accepted as truths, even if it is painfully obvious that they are nonsense (such as Moses made the rivers waters part so he could cross) is physically impossible. Contradictions in religion are generally, such as why would God let someone die, who was such a good worshiper are put down to testing one's faith. If not for memes, it is hard to imagine why religion would have spread to the extent that it has. Religion is then a good example of memes at work. Humans are supposedly intelligent so how is it that so many believe in the vast number of contradictions that are associated with most religions.

Another set of memes that are widely (and rapidly) spread are those associated with music and songs. What has always interested me is what makes a certain meme or song take-off. Why do certain songs become so popular? What is it that causes the sudden avalanche of copying from one person to another that makes a particular song so popular? I would assert that advertising plays a large part in this. Advertisers are constantly looking at new ways to exploit the rapid spread of a message. In effect, by combining the product with other memes, they can make their meme spread more rapidly. Nike exploited the "tick" and the good will, correctness and positive features associated with that. Sometimes advertisers will use a catchy tune, an image, a catchy phrase, a funny scene or scenario, or something silly or ridiculous (car yards and carpet stores excel in this regard) to propagate their product. One wonders how large a role meme publicity plays in the grandeur of companies like Coca-Cola ("It's the real thing"), Nike ("Just do it"), and McDonalds. News also moves in mysterious ways, it is difficult to tell which news item will break and spread uncontrollably, and which will not go anywhere. In 1992 to 2000 I have made a few media releases from my university and it is interesting that some of these were covered by many media outlets, such as radio, television and newspapers, whereas some did not get very far at all. Politicians try to exploit memes as well, memes that may embarrass the opposition party and ensue creditability to their own party, helping them to win the next election.

As memes are things we imitate, and since we do imitate each other, even sometimes without reason, there is a hidden force which occasionally (never quite sure when, why, how strong, or in which direction strong) pushes everyone together. You often get that impression when you have just witnessed an election, and there was a landslide win to one of the political parties, or when the stock market suddenly goes up or down dramatically.

We would like to also mention a couple of other big memes or traditions, such as those associated with giving Christmas presents (to our family and friends), having a Christmas trees (originated in the 16<sup>th</sup> century in Germany), believing in Santa Claus (why do we propagate these lies), giving birthday cards (this originated in England, I believe), and giving chocolate eggs at Easter. Some of these memes are only a few hundred years old, and one wonders if they might have been started by store keepers to boost sales, are now entrenched in our society, and are widespread all over the world. Such is the power of memes.

As Blackmore points out sex and food have an unfair advantage over other memes, because they

also have a biological niche, and basically got a head start on other non-biologically based memes.

One can ask why we would transmit these personal memes to our friends.

It is also quite apparent that memes are influential in our daily lives. One just has to look at fashions, like clothes, haircuts and mobile phones to see how important they are. Mobiles phones, for example are useful devices, especially for tradesmen and professionals, but why are they so popular with young kids, and why do they all have to have one.

Note that sociobiology cannot properly explain why we share information so freely with others, and why we do nice things for people. Although there may be some advantage in helping others, because they may help us back, this cannot explain for example why we would do something like help a adopt a child, when there is no direct biological benefit to ourselves. Blackmore suggests that we do such things so that people like us, and if people like us they will want to talk to and interact with us and so we will be able to spread more memes. I would suggest that we adopt children because even though they do not carry our genes they can potentially carry our memes.

With respect to my academic career one may ask why I would want to teach students. I could do a much more relaxing less stressful, and much better paid, job, but there is a certain satisfaction in teaching because you are giving your memes to others, your own little perspectives on reality, and they have to listen, and some want to of course. When you know about memes themselves, teaching can be even more rewarding, as it is for me. Indeed if it wasn't for the benefit of the evolving memes it would be difficult to explain why we have an education system. I agree that my thinking does not really take into account the fact that there is a reward associated with doing things for others, called money, and that we can use this commodity to buy goods and services, but why and how has money evolved. One could argue that money emerged as a matter of human interaction and exchange of ideas. It is a memplex and evolved to free people to specialize on their own memplexes, as this is a legitimate means by which more memes will be discovered. There is a distinct advantage in breaking down tasks in this catagorized manner. The world is too big to do everything and this is a natural way to cover all bases. large problems are usually handled by subdividing and conquering.

In academic circles, postgraduate students are sought after because you will pass onto them your cherished memes, which they will propagate further on your behalf.

much of what we teach students is based on imitation, we show them how to do problems by doing them in front of them. they are mostly collecting memes and informations. I myself try to teach my students how to think, how to generate new information intheir own haeds.

**Nature vs Nurture (gene vs meme, coevolution)**

The old argument Nature versus Nurture is really the same as gene versus meme, and from numerous investigations both seem to be influential, for example although there is a strong link between schizophrenia and genes, and between Alzheimer's disease and gene, there are many more cases where gene are not implicated suggesting that the environment (memetic and physical environments) in which we live has an enormous influence on our health and survival.

### **Things that we do that do not seem to have an obvious biological purpose**

One may well ask, as Blackmore does, why do we (humans) think, why we talk to each other, why do we write books. Other animals do not seem to have a need to do these things. If they had a clear biological reason then why are they not also doing these things. If one suggests that we have evolved beyond other animals, then the question is why is this so? Some animals have been around for much longer than us. Thinking is an energy consuming process and why would we waste so much energy thinking. Blackmore says that we think for the benefit of the memes. We might have evolved to think to generate new solutions to problems we encounter with survival, but it can also be argued that we think to generate new creative ideas or memes. Thinking is a process whereby memories or memes are combined together in unusual ways. Why do we talk to each other? Biologically we have no need to talk to each other as much as what we do. Cooperation helps us in return, but this cannot explain the extent of our desire to help others. There is also the altruistic aspect to helping others. We do have some similarity in our gene pools. Blackmore suggests that talking benefits the spread of memes. Sometimes we even spread memes that may be harmful to ourselves. Why do we have schools and universities and all of the other means for spreading information and memes to others?

One should note that we do think a lot more time than we talk. This suggests that the blind spreading of memes is probably not as important as the generation and manipulation of memes in our heads. Blackmore would probably suggest that thinking is the process of memes competing with each other for the limited space in our heads. Our contention is that thinking is more of a creative process, in which the brain derives new ideas and new memes. New ideas are important to us for creative solutions and adaptation to a ever changing environment.

As Blackmore points out we humans help each other and other animals. Why would we do this, at the expense of our own genes (and memes for that matter), remembering that we are in competition with other animals and humans, for the survival of our genes and memes. One reason why we might want to help other people is that they can help us back when we are in need. We could also try to save other species because we realise that bio-diversity may be important to our survival, but we have been doing these things for centuries, and have only realised recently that our species may be useful to us. Blackmore suggests that we do these things because we want to be liked, because if we are liked we have a greater capacity to spread our memes (and genes). Blackmore gives examples of altruistic behaviour, such as adoption, where it is difficult to explain in biological terms.

Another human behaviour that is difficult to explain in terms of genetic advantage is homosexuality. Although one could suggest that some homosexuals have some of the genes which are more appropriate for the opposite sex, this cannot be true for all. Why for example does the male perpetrator in a homosexual relationship engage in this type of sexual behaviour? One could also suggest that many young people are enticed into homosexuality by the current prevailing fashion, or memes. Prostitution is another example of something that we do that does not have a full biological explanation. Although sex is involved, this is done more for pleasure and contraception is used to

avoid the prospects of pregnancy.

Another example of something that humans do that does not seem to have a natural genetic explanation is suicide. What is the genetic advantage in killing oneself, especially at an early age? At first sight, memetics does not seem to be able to account for suicide either, as what advantage is it to memes to have one less meme machine communicating memes. This person could however feel that they do not fit in with society and the memes that one expects one to have, and so their life may have no real impact on the spread (or lack thereof) of the memes. It may also be that that person actually hindered the spread of memes in some way by not fitting in with everyone else. One reason why someone might kill themselves is to gain attention either for themselves or for some cause. Killing oneself for a cause is especially significant because a cause is a belief, an ideology, a meme. Some people who have committed suicide have become famous (or infamous) for their actions, and their memetic reason for why they did it becomes important too.

Another example of something that we do that does not seem to have a clear biological explanation is vasectomies. Why would a man, who is bred to reproduce as much as possible want to have the chop you may ask. I would assert, as Blackmore also does, that the female is more attune raising and caring for offspring, the biological role of the male is to impregnate as many females as possible. I would suggest that vasectomies have become popular is the reason why males do it, which is of course a memetic reason. One could argue that, parents may have decided to go down this path because they feel they can offer so much more to the children that they already have, and to have more might compromise the situation for them. However, when one makes such a statement they are also referring to the memes and ideas that we are able to offer our children, and so this also touches upon a memetic reason.

Most of what we do does not seem to have any logical biological purpose. Some of the other examples include why we do mathematics, why we work so hard, why we think that our careers are so important, moer important than our children.

One can also ask why do we so freely give away our ideas? It could be because ideas will be given back to us if we freely pass on any ideas and tricks that we discover or get from others. There is certainly a cooperative aspect to this type of behaviour but one could imagine people getting information from others without giving anything back themselves. These people could be shunned by others if they are seen as freeloaders. Blackmore's explanation for this type of free sharing of ideas is for the benefit of the memes. The copoerative expalnaton suffer from the fact that we argue our points of view with others, we try to convince othesr that we are right. Why would we go to so much trouble.

One of the other things thatw e do as humans is try to impress ecah other. One of the most powerful forces driving human endeavor, even more powerful than money, is fame. Why would we want to be so famous, or rich for that matter? In memetics the answer is that we would like to be able to spread our memes as much as possible to others. This can be achieved if we interact with other people like ourselves, with common interests, as then they will listen to us, of if we hold a position of power (such as an employer, a politician, or a songwriter), as then they will be forced to listen to us and act in way that we see fit. This may be why many of us vie for

powerful positions, and why we work so hard, often at the expense of the family, our own genes. Here I am at my computer, still at work at 8pm. Why?

What makes religion such a powerful meme is the fact that they are usually propagated by selling them with the fear of damnation if you do not believe.

With Blackmore's strict definition she argues that other animals do not copy each other. When a bird copy sounds off their mother she argues that this is an innate behaviour and is not the same as the copying that we do. In any case what is true is that humans copy each other to an incredible extent. A recent article in Scientific American suggests that chimpanzees also copy each other, but to a lesser extent.

We like memes that are convenient, that make life simpler for ourselves, so we can do other things. However what is also true is that the more you have, the more you know, the more you need and the more you want. After someone invented fire, came the interior fireplace, the chimney, coal mining, wood cutting, wood delivery, chimney sweeper, pollution experts, etc.

I would suggest that the brain is a natural generator of creative ideas, that it is general amongst the population and that thinking is associated with this process. Although it may well be true that much of what we learn is based on the transmission of memes, we do generate semi-novel ideas and ways to get things done. As an example I had to fix an old antique cedar box that I bought from an auction. In the process I encountered some unusual problems, which I solved by inventing some novel wooden tools to perform some of the specific functions I required in order to glue together the broken top. After I had finished doing this, I threw these unusual bits of wood away. A couple of days later, the same story, I was fitting the new capital mouldings onto the verandah posts on my house. As the clamps were not big enough to clamp across the outside of the capital mouldings my son Johnny and I decided to use the clamps to hold bits of wood underneath the capital mouldings to hold them up while the glue dried. Initially we used two clamps, one for each pair of opposite faces, but later I realised that we could get away with only one clamp if I made the bits of wood long enough to extend beyond the post, as then they could also support the mouldings perpendicular to them. These ideas are not ingenious but I think illustrate the general ability of humans to create, adapt and improvise to solve different situations and problems, that they may not have seen someone else do before. In some cases these novel tricks that I had 'invented' used bits of information/ knowledge that were previously known to me, sometimes I might combine a number of ideas in my head, and other times I might just stumble (not completely without some logic) onto the solution. On other occasions I would come up with a completely new way of doing something. Humans are not only gifted in their ability to transmit and acquire memes but they are also very creative. We are able to create completely new situations and solutions. Blackmore would argue that memes gave us creativity, but the parallel processing of the brain, the overlapping storage of memories, not just in humans, but also in other animals, suggests that creativity may have come first. These creative ideas have a natural origin if one takes spurious memory seriously. Spurious memories, as generated in neural networks with distributed overlapping storage are basically of two types, ones that consist of combinations of memories and ones that have no resemblance to the stored memories. The latter type are sometimes also called spin-glass states after the type of model where they are seen to arise in. It is particularly interesting that both types of creative ideas are naturally explained by spurious memories.

The beauty of human creativity is that we are able to generate completely new solutions to problems and we are able to create our own memes. Although this process aids the evolution of memes, it was more probably present in humans first, in particular that aspect of creativity referred to above. One could also suggest that memes have learnt to exploit this neurological characteristics in humans.

From my own experience, I know that at times I can be quite creative, and that this creativity is not copied directly from other people. Recently I had to devise a ‘clever’ way to cut some verandah mouldings with a saw that could only cut about half way through the timber. The solution involved cutting the timber at 45 degrees to the length of the timber with a vertical cut, followed by rotating the timber and cutting with the saw blade at an angle of 45 degrees to the vertical, followed by flipping the timber around and completing the cut with another vertical cut at 45 degrees to the timber. No one showed me how to do this, and although it may sound to be quite trivial, I would assert that it is creative. Solving puzzles, such as mathematical puzzles, is another good example of how we solve novel problems/situations without direct recourse to memes.

### 3.5 Criticisms of the Dawkins/ Blackmore theory

Deficiencies of BD theory

Some of the ‘deficiencies’ of the BD theory include

1. Human minds are creative and can generate their own information, not restricted to just copying.
2. Even if memes created the “self” for their own benefit, self-consciousness could have evolved further for the benefit of the human individual. There are clear advantages for us to have self-consciousness. For discussion purposes I will take consciousness to be the knowledge of ourselves and our experiences in relation to the world outside of us, or our heads, past and present. If you like self-consciousness is like a model of the self. Self-consciousness has survival characteristics because it allows us to see ourselves in relation to others, and so we can see how we should act towards others or socially. Blackmore suggests that there is no self, that it is an illusion, but if the self really exists then the memes are also slaves to us. In this view there dynamics involves an interplay between memes, genes and mind (creativity and self).

Blackmore also proposes an interesting theory of the ‘self’ (or self-consciousness). She proposes that the self is just a collection of memes (or memories) and that we believe that there is such a thing, an ‘I’, because this belief protects memes. When we say that “I believe that ...”, this adds added protection and spreadability to that meme. There is however a dilemma in this argument in that if we all were to protect own own memes then how can this help memes overall. We suggest that competition plays an important role in this regard and that maybe the capacity of the human brain is not as limited as originally thought. We also present our own theory as to why we would like to propagate the myth that there is a little person inside our heads, that we are in control, when the scientific evidence clearly suggests that it is just an illusion. If Blackmore’s ideas are valid then this also means that to some extent that we are not in complete control of our actions, that we are just acting out our memes, or reacting according to our previous experiences, that is memory. It also suggests that our spiritual self, or our soul, is just a collection of memes, which is interesting since our genes represent our physical self, the phenotype expression of our genes. When we die our memes are our spirit that survives our physical death.

3. Blackmore asserts that memes compete for the limited brain space or resources, but when she

argues that we have developed a self-consciousness so that we can propagate our own memes, with the prefix, “I believe”, “I think that”. The origin of the “self” is meant to have come about for the benefit of memes. But which memes are we talking about? The memes which are not in our heads, that we are not going to protect and propagate, do not receive any benefit by such a process, so why would it have evolved. In other words, One meme’s meat is another memes poison. Why would memes want this competitive device/ mechanism? One could argue that this competition sped up the evolution of memes, but what is puzzling is that our beliefs are often clouded with misconceptions and prejudices so how would memes benefit from such a process that was not based on absolute truth. Religion serves as an obvious example of something that we propagate in this way, “I believe in God”, yet it is more likely to be false.

Blackmore also ignores the profound contribution that is made through creativity, and competition and cooperation. Clearly the human brain/mind is capable of generating completely new memes, which may or may not be based on previously acquired memes. The brain is also capable of thinking, or combining memes and information in novel ways, and checking if these newly generated packets of information have any worth in that brain’s model of itself and the world around it. Blackmore suggests that thinking, creativity, and our behaviour, in how we spread memes/ information, were developed in the brain to suit the memes, themselves. We feel that creativity is naturally generated by the way that memory is stored in the brain, in a distributed and overlapping fashion. Memories generally share common neural activation states and as a consequence of this the brain generates so called spurious memories which generally consist of combinations, but not all, of the stored memories. Blackmore suggest that social behaviour and cooperation among humans is also meme driven, but there are also other forces at work that would appear to have a genetic origin. Ants, for example, along with many other ‘social’ insects, such as bees, wasps, and termites, and some groups of animals, such as chimpanzees and dolphins have complex societies. If these insects and animals do not exchange memes, as far as we know, at least to the extent that we do, then some of these social behaviours must have a genetic origin. Blackmore further suggests that everything is always evolving to get better and better, but this is not necessarily the case, as what may be better now, in some environment, is not necessarily better in another environment, which is constantly changing. This is perhaps the biggest weakness of the Blackmore theory, in that there is no well-defined fitness or goodness function for memes, but the same is incidentally also of biological/ genetic evolution. It is difficult to explain even for a biological system what it means to say that other living organisms are evolving to improve themselves. What one normally means by this is that that creature fits in well with the surrounding environment, biological and physical. One also needs to consider the second law of thermodynamics in physics, which asserts that the entropy, or the number of allowed states of the Universe is actually increasing with time, which suggests that not everything is always improving in goodness, fitness or generating patterns or symmetry.

If we do something that is not intimately connected with survival Blackmore almost instinctively says that it is a result of memes, but with many such things one can generally come up with a biological evolutionary explanation, although at times it may sound a little implausible, it is not

impossible. As an example consider the question of why we play chess. One could play chess to earn a living so as to feed the family, or one could play chess for enjoyment only, which could be construed as keeping the person happy, so that he does his other required duties. This then also highlights one of the other points which has been ignored by Blackmore, namely that human pleasure plays a key factor in why we do things. We also do things for our family and friends for their pleasure. Actually the other emotions are also important in this regard as well. Note that emotion does not constitute a meme but we would assert that emotions control memes. If a meme is hurtful to us, whatever that actually means, we will not propagate that meme, and if a meme is useful or give us pleasure, then we will propagate that meme to others. On the other hand, although emotions do not constitute memes, one could argue as Blackmore does for the origins of the 'self' and language, that memes are the reasons for the evolution of emotion. We feel however that emotion also has certain biological advantages. Things that we like are generally good for our survival and there is a biological purpose for emotions.

## more on creativity

Memes can also combine and errors can occur in their transmission. The probability of errors is actually quite large for memes compared to the replication of genes. In fact errors in transmission of memes is also one way that they can improve. One possible contribution to creativity may simply correspond to the small inevitable errors that accompany human memory and actions. There is also another way that human 'errors' in memory can occur. It is well known that because memories are stored in a distributive overlapping manner in the brain that this also generates so called spurious states which generally, but not always, correspond to mixtures of stored memories. Creativity and the evolution of ideas are probably linked with these types of states as well. The important point that we are trying to make here is that the human brain is naturally equipped with mechanisms that allow it to make, and subsequently test, small errors and to combine various memories into larger memories that may have greater usefulness.

Memes can be defined as the things we imitate of one another, or structures of (mostly useful) information, or patterns of Nature. It is human creativity which discovers new and useful memes. Human creativity is itself based on the fact that memories are stored distributively in the brain.

There are 3 or 4 different origins for creativity possible

- The distributed overlapping storage of memory in neural networks, creates spurious memories. This is the way that different memories can be combined together in neural systems. When one is thinking they are generally 'creating' such memories, which are subsequently tested with respect to other stored and established memories and principles. The brain decides which memories, thus generated, to keep and which to throw away. This is a sort of evolutionary process within the brain.
- Errors in the transmission of ideas or information from one person to another can generate new ideas.
- Creative states may also arise from the interplay of memes in many minds. There are probably



also spurious states which are generated by the overlapping interaction between many people. These are like spurious memories between a group of neural networks. Recently I watched a group of people at the local pool trying to collectively find a way to raise up to 4 people on their shoulders, one above the other. They had successfully done this with 3 people but 4 seemed to just out of their reach, so they discussed ways to get around the problem. It is as if one brain on its own is unable to cope with the mental capacity required to solve some problems. In some sense, a group of people working together, 'brain storming', are able to generate more noise and hence creative solutions.

Blackmore's position on creativity is that memes made it happen, that is it arose in the human mind for the benefit of the memes. Recently Vera John-Steiner (Oxford University Press, 2000) has suggested that our thinking and creativity are really collaborative process, which in spirit is similar to Blackmore's memetic point of view because both are suggesting that creativity arose from our ability to communicate with each other. Blackmore is suggesting that they arise for the benefit of the memes whereas John-Steiner could be suggesting that they arose as some sort of collective process.

As memories are stored in the brain as content addressable memories, the brain is noise tolerant. What this means is that if the brain is presented with noisy input it can still recall the stored memory which is closest to it. This suggests that noise in the brain is an unlikely source of new memories.

It is well known that people who have an excellent photographic memory are lousy at generalizing things. The Russian who can recall all of the text he has read in the last 10 or 20 years (####) cannot tell which one of his friends rang him because as he puts it his friend has up to 30 different voices. We would not be able to distinguish between these different voices. People with an excellent photographic memory also have trouble generating something novel. We feel that the same forces are at work here when it takes a group of people to solve a complicated problem. The group acts as an attractor at the same time, just as a collection of neurons help each other. The collective nature of the group helps to arrive at an attractor for the required solution.

The human brain is also equipped with the ability to think, or to be able to toss ideas and states in our brain and cross correlate them against other states in the brain. These may well just be the so called spurious states at work. Spurious states naturally combine combinations of states together and this may be the brain's natural way to combine these states together. If we accept the robotic human mind then spurious states may just crop up themselves and this is how thinking, or recombinations of memories actually occurs. It is this process which also helps the brain decide which memories to keep and which to throw away. The usefulness of a memory is determined by how well it fits in with other memories stored in the brain. Obviously if it does not fit in very well then it will be deemed as useless and will be thrown away. This is an evolutionary process that is taking place within one single brain. Memes also compete for compatibility with each other in ways like this, and more intricately as many individuals are involved.

Blackmore's position on creativity is that memes made it happen, that is it arose in the human mind for the benefit of the memes. Recently Vera John-Steiner (Oxford University Press, 2000) has suggested that our thinking and creativity are really collaborative process. In essence Blackmore is suggesting that creativity arise from memes for human interaction, whereas Steiner is suggesting that creativity arose from human interaction. Both suggest that creativity arose from our ability to communicate with each other. Our position is that creativity is a function of the brain and is closely

tied in with spurious memories. Another slightly different angle is to suggest that creativity, or at least some form of it, may arise as a collective state in a group of humans, just as spurious states arise in a collection of neurons. We will discuss this again later when we look at the fractal representation of meme-space.

It is also quite clear that we rarely come up with very creative or new ideas ourselves, that most of what we learn to do, is based on what we copy from other people. Even though the brain has some capacity to generate creative states, corresponding to the spurious memories, these are probably few in number, based on the fact that most people do not appear to be that creative. This is possibly why we hold creative people in such high esteem, because we really do not have that many creative thoughts ourselves. On the other hand, the little things that we invent ourselves during our daily struggle may be more creative than meets the eye. For example, I had to wire up some reticulation at my house a couple of months ago (still not complete). As far as I knew there was only one sort of standard wire which was coloured orange. When I went to the reticulation store (Total Eden – that's a plug) I noticed that there were different coloured wires and I later realised (without anyone actually showing me) that I could keep track of where each wire went by using different colours. No one told me this, I figured it out myself. the question is how much thought, how much creativity is there in an ordinary act such as this. Another example concern the so called Dan Lock, which consists of a padlock and two keys, one of which is broken and the other is locked in the lock. When my colleague and I first solved this puzzle it took longer than our students and children took. Other than being a little geriatric I would suggest that the reason for this was because our students and children were able to use the information that we could always solve the puzzle if they made a mess out of it. When we got the puzzle, we were really hesitant to do a few of the clever steps that are required to solve this puzzle. Our students and children also know that we will yell at them if they are about to do something silly.

We hold creative people in high esteem, we give out prizes such as the Nobel Prize to creative people, but by the same token we also shun creativity. We tend to shun people who do not act normally, like everyone else, that is do not copy everyone else. This negativity also makes it very difficult to break the cycle and be creative. The fact that we generally copy other means that we tend to ignore people who do not copy us, but these people may simply be the people who are having an unusual or creative thought.

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they made a mess out of it. When we got the puzzle, we were really hesitant to do a few of the clever steps that are required to solve this puzzle. Our students and children also know that we will yell at them if they are about to do something silly.

I would suggest that the brain is a natural generator of creative ideas, and although it may be true that much of what we learn is based on the transmission of memes, we do generate semi-novel ideas and ways to get things done. As an example I had to fix an old antique cedar box that I bought from an auction. In the process I encountered some unusual problems, which I solved by inventing some novel wooden tools to perform some of specific functions I required in order to gluing together the broken top. After I had finished doing this, I threw these unusual bits of wood away. In some cases these novel trick that I had 'invented' used bits of information/ knowledge that were previously known to me, sometimes I might combine a number of ideas in my head, and other times I might just stumble (not completely without some logic) onto the solution. On other occasions I would come up with a completely new way of doing something. Humans are not only gifted in their ability to transmit and acquire memes but they are also very creative. We are able to create completely new situations and solutions. Balackmore would argue that memes gave us creativity, but the parallel processing of the brain, the overlapping storage of memories, not just in humans, but also in other animals, suggests that creativity may have come first. This creative ideas have a natural origin if one takes spurious memory seriously. Spurious memories, as generated in neural networks with distributed overlapping storage are basically of two types, ones that consist of combinations of memories and ones that have no resemblance to the stored memories. The latter type are somethings also called spin-glass states after the type of model where they are seen to arise in. It is particularly interesting that both types of creative ideas are naturally explained by spurious memories.

The beauty of human creativity is that we are able to generate completely new solutions to problems and we are able to create our own memes. Although this process aids the evolution of memes, it was more probably present in humans first, in a particular that aspect of creativity referred to above. One could also suggest that memes have learnt to exploit this neurological characteristics in humans.

### 3.7 The 'self'

#### **Other evolving systems**

These same principles of evolution and adaptation seem to also apply to other interactive systems, such as, social systems, political systems, legal systems, and science. There are also some other types of evolution. For example memories evolve in the brain. This can occur, through the generation of spurious memories and the replacement of pre-existing memories by memories that are better adapted to the situation (that is the best memory, or way to do something wins). This type of evolution is a little different to that involving genes or memes because multiple copies of memories are not made. Brain memory evolution can also take place as the neuronal level too. Synapses that are no longer useful are generally clipped or lost. In fact a lot of learning that takes

place in humans, particularly in relation to muscle movements, or what is also called non-declarative memory (memory that does not involve consciousness), and in the early stages of infant neural development.

Everything evolves, such as the legal system, our political system, tools, transport means, transport systems, science, books, computers, etc. The point is that everything looks like it is itself evolving, but at the centre of it all is the fact that humans are controlling this evolution of all of these various systems, and that is precisely the point. At the heart of the evolution of all of these systems are memes, and memes are the underlying replicator, or vehicle that controls the evolution of all of these systems.

I went to Bunnings (a hardware store in Perth) the other day and I was amazed at the almost endless array of tools that were for sale and the unlimited variety in the functions they performed. What caught me most was that not so long ago, say 40 years ago, there were hardly any power tools and most jobs had to be done with hand tools. Now just in power tools there were drills (a variety of different drills, with different feathers, such as driver drills, angle drills, impact drills, speed drills, hammer drive drills, rotary drills, cordless drills), saws (such as circular saws, reciprocating saw, compound mitre saw, cordless saws, chain saw, jig saw, trimmers), grinders (bench grinder, angle grinder, nibbler.), sanders (belt, orbital, finishing, random orbital), planers, routers, lathes, blowers, brushcutter, wiper snipers, hedgers, heat guns, and generators. All of the other products, gadgets, and tools at Bunnings were also just memes. For example there were brushes, paints, electrical cords, door bells, screws (wood, self-tapping, brass, short, long), nails (bullet head, plasterboard, roof, nail gun). Even the way that I was greeted at the entrance (“Good day sir”) and on leaving (“See you later”), how I was able to pay for the products (cash, credit card, cheque), and the way I was assisted by the shop assistance (courteous, trained). It also made me realise that at their most people they act quite autonomously, like robots, they act out memes that were shown to them, “How are you today sir?”, “Can I be of assistance?”. This is quite the norm with most people, whose work involves carrying out specific trained actions, which were shown to them by someone else or memes.

Cities evolve in quite standard ways, roads get wider, smaller buildings are demolished to make way for taller buildings, housing densities go up, streets become wider, inner city streets become one-way, more traffic lights and crosswalks appear, and so on. This system is in control of humans, but can one still imagine it to be a legitimate evolving system where the vehicles of change are people, Councils, law makers driven by preservation, better development and greed. Most cities around the world today look very similar, most even use the same traffic control signs. Roads systems evolve, the type of petrol we use evolves, the cars we use evolve, the gadgets found in cars also evolve. All of these systems are interdependent and are either in control of humans, collectively anyhow, and/or memes.

As noted before everything evolves, and ‘improves’ itself in the process. What we mean by this is that they improve their position with respect to other systems and memes. There is no well defined fitness function. The same situation occurs in biology, all of the creatures around us have evolved to fit in with every other creature around them. Just as we have biodiversity and ecosystems, the memetic world has the same general properties. The features of different animals that have evolved, like their eyes, legs and ability to move for example, correspond to things like rules, laws, money, credit cards, and services in the memetic world.

The fact that we buy and sell babies shows that we do things that have no biological sense. Why would someone sell their baby? Maybe if they thought it would be taken better care of, but our biological instinct is to care for our young. And, why would someone want to buy someone else's baby? To spread their memes to this child as it grows up, just as one does when they want to adopt a baby.

### What is left to be discovered?

The more we know, the more questions that arise. If one takes this on face value then the amount of knowledge that is left for us to discover out there is unlimited and is expected to grow exponentially. Although the latter may be true, humans can only understand as much as can be understood by a human brain. There is a theoretical limit to amount that we can learn, which is determined by the number of available brain states. Although a human brain can only store some  $10^{13}$  bits of information, the absolute theoretical limit to how many different states it can generate is more like  $2^{10^{10}} = 2^{10,000,000,000}$ . This number is derived by assuming that one tenth of all neurons in the brain may be involved with memory storage. Each of these cells can have 2 possible states (firing or quiescent), so there are 2 times 2 times 2,  $10^{10}$  times, possible states of the brain. This is probably an overestimate because it would not be feasible to have brain states where only one cell is firing (a group of neurons is required to sustain their mutual activity) or all cells are firing simultaneously, for example. Memories are usually recalled when a certain critical mass of neurons fire collectively. By the same token, memories with too many active neurons are unrealistic, as this leads to problems like epilepsy. A better estimate could be derived by assuming the only brain states that are possible are those in which one tenth of all of the memory cells are excited. In this case the number of available brain states, with a 10% coding level, is the number of different ways that we can choose  $10^9$  active cells from the total number of  $10^{10}$  available cells. This number still comes out to be something like  $2^{4,000,000,000}$ . This number is enormous.

One can think of the total amount of knowledge that we will be capable of understanding as the master meme. We only know about a fraction of what can be known. My friend Renato Doria joked about the psychological space when we were doing our PhDs together at Oxford University. Most people thought Doria was a nutter but there is some truth to his ideas. He suggested that there is a boundary between knowledge and the unknown, and that when we discover something we move this boundary outwards. According to Doria when we think we venture into the unknown psychological space and when we return we assess our ideas with the unknown. If we can connect our ideas to what is known then we can extend the boundaries of knowledge. This explains why it is difficult for us to make quantum leaps in knowledge, because it has to be connected to what we know and we have to convince others of our beliefs. This is why great ideas normally receive a lot of opposition when they are first proposed too. All of this fits in nicely with our suggestion that creative ideas correspond to spurious memories in the brain. It hence

follows that we can only have ideas which are generated by our current knowledge, and for something to receive widespread acceptance we need to be able to tap into that same spurious memory in others.

### 3.9 Modelling memes

#### 3.10 Conclusion: “Useless metaphor”, or “Theory of everything” or “theory of the human mind and society/culture”

##### 3.5 passing on our memes to our children

we pass our memes onto our children as well as our genes. mention self and grandparents. we also pass memes onto others, cause there is more than a biological purpose to life.

brainwashing-process whereby repetition, with or without reward or punishment causes us to accept something as true. is this memetic, or just the forced implanting of information into our brains.

creativity, autism and self may be intricately related to each other.

Everything evolves. Laws evolve, technology evolves, science evolves, and so on. In fact even the humble hammer evolves. Originally the hammer started off as a heavy metal object, or perhaps even a rock, tied to the end of a wooden handle and then someone decides to put a claw on the end of the hammer so that it can remove nails. Then other hammers are developed to make other jobs easier, like the sledge hammer for breaking concrete, and a small hammer for tacks and small nails. Even chocolate biscuits evolve, as manufacturers add peanuts, caramel and marshmallow. The biscuits compete to be sold to consumers and for space on the supermarket shelf. What is special about all of these evolving systems is that they are controlled by humans, and hence the evolution of memes. Humans are the crucial vehicle for the evolution of all of these systems and the creative human mind is essential for generating new ideas.

###

biology-physical attributes  
memes. Psychological attributes

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Arguing is process where people disagree about their memes or beliefs.

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Love is often defined as when someone thinks of someone else, and consequently their memes, more than themselves and their own memes.

Also involved with this subject is the question of cruelty. Does cruelty affect the self? Is it a meme, or a means to spread memes?

We do not have democracy (eg usa president and preferential voting Australia) because certain groups wish to protect their interests, memes and unfair supremacy to power.

pressure to

be thin and beautiful.

are linked with the four biological F's: foraging, fighting, feeding, and sex, may also have a biological explanation, but biology cannot explain why we go so far with some of these activities.