BELIEF SHOCK

Perennial Philosophy
for the
Intellectually Adventurous

by

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1: False Belief

A characteristic of beliefs is that all of one's own beliefs are true — or so each of us believes. It is as if each belief carries a piggy-back belief, and this piggy-back belief is that the belief it rides is true. How does one know that one's own beliefs are true? One does not *know* it, one only *believes* it. If you ask someone why a they believe a particular proposition — that God exists, say, or that God does not exist — the likely answer is that they believe it because it is true: "If it wasn't true then I wouldn't believe it!" You probably have this attitude towards your own beliefs, and you do so because of their piggy-back beliefs. And, you may note, the piggy-back belief is believed to be true because it has its own piggy-back belief, and so on as far as you like to question.

But it is almost certain that some of almost everyone's beliefs are false. Of the more than six billion people in the world today, it is extremely unlikely that any two have exactly the same set of beliefs. One only needs to consider the variation in religious and political beliefs, and the variations within any one sect or party, to say nothing of ego-centric beliefs about oneself and one's importance in the world. Or consider whether you have ever met anyone who agreed with you on everything. And if there are six billion sets of beliefs, all different, then at most only one set can be completely true. This means that the chance of you having a completely true set of beliefs is negligible — rather more negligible than your chances of winning a major lottery.

Our beliefs are part of us, and to lose a basic belief is like an amputation, resulting in a belief shock. Belief shock is what occurs when an important but previously unquestioned belief is found to be false. The most common such losses these days are those of religious disillusionment, such as loss of Sunday School beliefs because of scientific knowledge; but we know of some that occurred in the past which must have been very painful in their day: the Earth is not flat, but spherical; it is not fixed at the centre of the universe, but is flying at incredible speed around the Sun; and humans were not specially created in 4004 BCE, but evolved from apes. Lesser belief shocks were Galileo's telescopic discoveries that the Moon has craters and that Jupiter has moons, Kepler's discovery that planets travel in elliptical orbits rather than in the perfect circles that the Greeks supposed, and

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Newton's proof that celestial matter is the same as terrestrial matter. There are also some major belief shocks in modern physics, with which not even most physicists have been able to come to terms; they are not generally accepted by the public because of their mathematical nature, but they are easily stated. One, coming from Einstein's theories of relativity, is that space and time are not distinct, but form a four-dimensional space-time; and if time is dimensional then there is nothing travelling through time — because if there were, how fast would it travel? Another is that the basic stuff of matter is somehow both, and yet neither, waves and particles.

In this book we are going to examine yet another belief shock, both contemporary and major, and numerous after-shocks that follow from it. It is the major barrier to profound truth, although the after shocks also all break lesser barriers. It was discovered by Bertrand Russell, but very few people have ever heard of it. But first we must consider why we should ever change any of our beliefs.

There are two ways to discover and correct false beliefs: empirical fact, and reason. Certain empirical facts, or certain internal incoherence, may disturb your belief system, and this leads to two possible uses of reason: reason may use these facts or contradictions to discover and correct false beliefs, to do which is science and/or philosophy; and reason may manufacture invalid arguments to bolster and maintain false beliefs, to do which is sophistry. An example of such a disturbing empirical fact is the fact that the world has more than six billion people, each with a different set of beliefs, so that your own beliefs are not all true. The sophistical response is that you *know* that all your major beliefs are true: you believe them because they are true — if they were not true you would not believe them. The philosophical response is to ask how you can discover which are false, and how you can correct them.

I once knew an archeologist-priest who had excavated a cave down to a level of human habitation of 20,000 years ago. He was asked in my hearing how he reconciled this work with his belief in Genesis, and he replied that he had two rooms in his mind: one for religion and one for archeology, each with a door, and that he never opened both doors at once. I also once knew a behavioural psychologist, who claimed that there is no such thing as any mind between stimulus and

response. I asked him how he reconciled this with going to a concert or to a party, where the existence of other minds was an integral part of the enjoyment of such affairs. He replied that people wear different kinds of hats when doing different things, such as a psychologist's hat, and a social hat; and that one must not wear more than one hat at a time. Another example comes from modern physics, which is so contrary to common sense that anyone familiar with it must either reject one or the other, or else be careful to keep the two belief systems well segregated. Anyone who has tried to understand the nature of four-dimensional space-time, a wave-particle, or a black hole, is familiar with material that is wholly indigestible to common sense.

Having a closed mind is a very comfortable state to be in, which is why there is so much sophistry around. But a closed mind is a stagnant mind, and anyone who wants to mature intellectually and artistically must learn to reject sophistries in favour of a philosophical approach to their beliefs. However, the more basic a belief is, the more painful and difficult it is to change it, or even question it; and some of the false beliefs which are barriers to advanced mental maturity are very basic indeed.

The greatest philosophers of the past have all agreed on one major claim for philosophy: a philosophical life can lead to ultimate maturity of mind, ultimate spiritual development, an altered state of consciousness that is as far above the rational as the rational is above the irrational, a state characterised by profound truth and profound understanding. This is sometimes called perennial philosophy. The ancient Greeks called its ultimate goal wisdom, Spinoza called it happiness, blessedness, or *scientia intuitiva*, Hegel called it the sublation of the finite self into the infinite absolute, and Bergson called it the suprarational. They all made it out it to be the most valuable thing a human being can achieve, besides which all other achievements — fame, fortune, power, or honour — are dross. As well as being the most valuable achievement, however, it is also (naturally enough) the most difficult — which is one reason why it is so rare. The first obstacles to wisdom are the barriers that are false beliefs

Our most basic beliefs are, of course, the beliefs of common sense. For most people common sense is as sacrosanct and unquestionable as dogmas are to fundamentalists, even though the

history of ideas is a history of corrections to common sense. When common sense first met the idea that the Earth is a sphere, rather than flat, the reaction was that it couldn't possibly be a sphere because if it were, not only would antipodal people all fall off, but the oceans would all drain off as well: the existence of the oceans *proved* that the Earth is not a sphere.

This is not to deny the merit in common sense. Common sense is the cumulative practical experience of generations of human beings coping with the difficulties of survival. For this reason people who are practical and down to earth value common sense above all other beliefs and are sophists in its defence. For everyday living, common sense is wonderfully reliable, and to be cherished for that reason. But this reliability does not guarantee the truth of every common sense belief, and some of them remain as false as the belief in a flat Earth. One of the characteristics of common sense is that it always prefers simplicity: given two alternative beliefs, the simpler one is the one that belongs to common sense. And where common sense usually goes wrong is through over-simplification: a flat Earth gives a simpler explanation of local geography than a spherical one, and witchcraft is a simpler explanation of diseases than bacteria and viruses. Common sense also over-estimates the importance of humanity in the scheme of things: being at the centre of the universe makes us exceptional, as does our special creation in 4004 BCE.

In short, philosophy leads away from common sense towards wisdom, and sophistry leads away from wisdom towards common sense. Sophists deny any possibility of profound truth, and repudiate philosophers who advocate it. And sophistry is easy and pleasant, while philosophy is difficult and painful, so wisdom is very rare.

The claim of this book is that profound truth is indeed possible, and that it is difficult to obtain because it is blocked by false beliefs. Correction of such false beliefs produces belief shocks, which are painful at the time but a small price to pay for the improved understanding that results. Ultimate understanding is the possession of profound truth, or wisdom in the proper meaning of the word.

In every major civilisation there have been teachers and philosophers who have taught the possibility of wisdom. In this book we are going to try to follow them along the difficult path to profundity,

by using reason to discover and correct false beliefs. But before we do so, something more must be said about beliefs: what they are and why we have them.

Our most important source of knowledge is perception. (Indeed, those philosophers known as empiricists claim that it is our *only* source of knowledge: the word *empirical* means known through the senses; but since they do not perceive that our only source of knowledge is perception, one wonders how they know it.) When perception fails us, as it often does, we use perception substitutes. There are three kinds of perception substitute: memory, expectation, and belief. We cannot perceive the past, but have memories as a substitute; we cannot perceive the future, but have expectations as a substitute; and for anything else that we cannot perceive but want to know about, we substitute a belief, based usually on word of mouth or other evidence. All of these substitutes can be false, and expectations often are, but in general we can rely on them. Thus when you flick the light switch you expect the light to come on; usually it does, but sometimes your expectation is false because the light bulb is fused. And that memories can be false is proved if you can remember discovering that one of your memories was false: either this second memory was false, or it was not, and in the latter case your first memory is false — in which case it is indubitable that at least one of your memories failed.

But let us concentrate on beliefs. For example, we cannot see out of the back of our heads, so what is behind us is unperceived but believed to still exist; this belief seems to be easily checked by turning around. Again, when we stop perceiving something because of going away, we believe that it continues to exist, and this belief is checked by it still being there when we return, and by the evidence of witnesses who perceived it while we did not. Other beliefs are more difficult to check directly, but may be supported by their consistency within an entire belief system.

Another point about beliefs arises from the fact that humans are a species driven by curiosity: we want to know why. To know why is to have a “because,” an explanation. Explanation is causal: to describe causes is to explain their effects. A “because” is an offering of a cause, a “by cause of,” as in “Why won’t my car start?” “Because the fuel tank is empty.” Most causes, however, are imperceptible and so a matter of

belief; hence most explanations invoke beliefs in imperceptible causes — underlying causes, as they are often called. Among the explanatory belief systems that humans have invented are those we classify as myth, theology, metaphysics, theoretical science, and common sense. For example, there is an Inuit explanation of solar eclipses: they say that the Sun and the Moon, wanting to make love, put out the light — like anyone else. The desire, and the act, are imperceptible; only their supposed effect, the turning off of the light of the Sun, is perceptible. The medieval theological explanation of the wandering courses of the planets — that they are each guided by a guardian angel — explains perceptible astronomical features by means of imperceptible angels. The metaphysical explanation of birth and death as movement of an immortal soul into and out of a corporeal body explains certain perceptible facts by means of imperceptible souls. Theoretical science is the attempt to explain empirical science; empirical science is our scientific knowledge of empirical things — perceptible things — and theoretical science is various descriptions of hypothetical imperceptible causes of them. For example, weight is perceptible, a force, belonging to empirical science; and the explanation of it by means of imperceptible mass and imperceptible gravitational fields belongs to theoretical science. Indeed, *theoretical* means non-empirical, or imperceptible; and all the entities of theoretical science are imperceptible, as will be explained in greater detail later. Finally, many common sense beliefs are explanatory. Each of us explains the way other people behave by saying that they have minds basically similar to our own. And, of course, other minds are imperceptible: each of us can perceive, by introspection, only his or her own mind — never anyone else's.

The rest of this book is rational argument towards the profound, towards understanding the teachings of great thinkers. If you wish to continue it must be because you want to correct your false beliefs, because you desire wisdom. This means that at the conclusion of every argument in this book you must judge whether the argument is sound or not; and you must also judge whether your judgement is wise or sophistical.

Another point about the journey towards wisdom concerns unity of belief. As one progresses towards wisdom one discovers more and

more unity within one's understanding — unity that replaces disconnected beliefs, to say nothing of incompatible beliefs. Unity between science and poetry, between mathematics and music, between evolution and theology, and between the me and the not-me. The priest-archaeologist and the behavioural psychologist just mentioned are examples of serious disunity of belief. Those readers who are already sympathetic towards the idea of profundity will know intuitively that unity is an essential part of it. As we work our way through this book, various unifications of ideas will be an indication of progress towards wisdom.

2: Identity and Change

We next consider a false common sense belief discovered by the ancient Greeks, and some of the sophistical attempts to salvage it. To discover the falsity of this belief is puzzling rather than painful, and the demonstration of its falsity is simple; so it is a good example with which to start the journey towards the profound. However, it is not a direct antecedent of the major belief shock of this book, so if you are in a hurry you should skip this chapter.

The example is called the problem of identity and change, and a special case of it is called the problem of personal identity. We begin by defining *identity* and *change*.

Identity in philosophy means oneness, or *one and the same*, as in "Mount Everest and the highest mountain on Earth are identical." This meaning should not be confused with the alternative, but incorrect, meaning which is that of similarity, as is *identical twins*, in which there is twoness rather than oneness, and similarity between the two. The word *same* has both these meanings, and is often used to obscure the incompatibility of oneness and similar-twoness. No one would argue that because Bob and Bill are identical twins therefore they are similar, therefore they are the same, and therefore they are one, but it is surprising how often such equivocation between the two meanings of *same* is used by sophists — as will be illustrated later.

Change is so familiar that it hardly needs to be defined, but we will do so nevertheless: a change is a combination of two relations, *dissimilarity* and *duration*. So if something is, after a certain time, dissimilar — different qualitatively — from what it was earlier, then it has changed; and if it is not dissimilar then it has not changed.

We begin with a simple logical statement: qualitative difference entails quantitative difference. This means that if we are considering two names or descriptions of things, then if what they name differ because of some quality that one has and the other does not, then they cannot be identical, they cannot be one and the same, they must be two things. For example, if we have a pack of cards we could describe "the top card in the deck" and "the ace of spades." If the top card is red, being in either the hearts suit or the diamonds suit, then it differs qualitatively from the ace of spades and so is numerically distinct from the black ace of spades: the top card and the ace of spades are two

cards. The reverse of this is that if they do *not* differ qualitatively then they *may* be one and the same, but they do not *have* to be — they may be two and similar: the deck of cards may have had an extra card introduced by a cheat and so contain two aces of spades which are exactly alike.

This principle that qualitative difference entails quantitative difference is easily proved. This is fortunate, since it needs to be proved in order to prevent sophists from claiming that it is false. The proof is as follows. Let 'A' and 'B' be the names or descriptions of some thing or things. Suppose that we are asking whether what 'A' and 'B' refer to are one or two, and suppose that there is a qualitative difference between A and B. This means that there is some quality, Q, say, such that A is Q and B is not-Q; or, perhaps, that B is Q and A is not-Q. If A and B are one then that one thing is at once Q and not-Q, which is impossible. Hence A and B cannot be one, so they are two. A simple exercise in logic.

For example, suppose that A is Jack Robinson and B is the leader of the band, and Q is the property of having a beard. If Jack Robinson has a beard and the leader of the band does not have a beard then it is impossible for Jack Robinson to be the leader of the band; Jack and the leader must be two people, they cannot be identical, one. The qualitative difference between Jack and the leader entails their quantitative difference, their twoness.

If now we apply this principle to change we find that it is impossible for one thing to change. Let X be some thing, supposedly changing with time. Call the earlier X, X_1, and the later X, X_2. If X has changed then X_1 and X_2 differ qualitatively — because of the nature of change, which is qualitative change over time — in which case they differ quantitatively and so they cannot be identical, they cannot be one. On the other hand, if X_1 and X_2 are identical then they cannot be dissimilar — because one thing cannot be dissimilar to itself — so they cannot have changed. So whatever X may be, if it changes then it cannot have identity through the duration of that change; and if it has such identity then it cannot have changed. Which flatly denies the common sense belief that *one* thing can change with time.

For example, if Jack shaves his beard at noon then we can distinguish morning-Jack and afternoon-Jack; and since they differ

qualitatively with respect to beardedness, they have to be two, they cannot be identical, one and the same.

Another way of putting this is that change, by definition, requires dissimilarity over time and dissimilarity requires twoness — one thing cannot be dissimilar to itself — hence dissimilarity precludes identity over that time, hence so does change.

In particular, the personal belief that we each have that each of us is one person, changing with time, is false. Either you are one person through time, in which case you do not change; or else you are not one person through time, because each time you change you are another, new, numerically distinct, person.

This is a very clear example of the clash between reason and common sense, and if you have not met the problem before it is a good opportunity to discover whether you are inclined to sophistry or to wisdom. If you are inclined to sophistry you will abandon this book with disgust; if you are inclined to wisdom you will examine the above argument very carefully, and then read on.

Let us look at how some of the sophists and philosophers have dealt with this problem in the last two thousand or so years.

Heraclitus and Parmenides were two pre-Socratic Greek philosophers of whose writings only fragments still exist. We have enough fragments, however, to show that each of them clearly understood the problem of identity and change, and took opposite positions on it. Heraclitus claimed that “Nothing is permanent except the fact of change” and that “You cannot step into the same river twice.” In other words, only change exists, there is no real identity over time. You cannot step into the same river twice because by the second time the river has changed and so is a new river; and you also have changed and so are a new individual. Parmenides, on the other hand, claimed that “All change is illusion” and “Only the One is.” In other words, only identity exists, there is no real change. Clearly, Heraclitus and Parmenides understood the problem well, and each resolved it by choosing one side or the other.

Plato, probably the greatest philosopher of all time, tried to deal with this problem by supposing that there are two worlds, one Heraclitean and the other Parmenidean. The sensible world — the world we perceive around us, the empirical world — is, he said, only

images of the other, or real, world, and largely illusion. Among its illusions is the illusion of change. The real world is composed of "Forms," which are eternal and unchanging, hence the real world has identity over time and does not change. Plato's theory of Forms is generally little understood, since Plato did not write much about it; but Plato did say that to get to know the Forms, especially the Form of the Good, is to achieve wisdom.

At about the same time, Leucippus (about whom little is known) and his follower Democritus proposed the first atomic theory, which was later taken up by the Roman thinker, Lucretius. Reality consists of atoms, they said, which are indivisible (which is what *atom* means: literally, uncuttable), which means that they have no parts, they are simple. It follows that atoms cannot change — because it is generally supposed that something must have parts if it is going to change — and so they have identity over time. These atoms are "falling through the void" and, in falling, make accidental combinations of atoms, which are what we call things. These arrangements of atoms change with time, without the atoms changing, so things have both identity over time and change: their atoms give them their identity over time and the arrangement of the atoms allows change. This position is sophistical, as will be shown in a moment.

Aristotle, who was a student of Plato and perhaps the second greatest philosopher of all time, had occasional lapses into sophistry. His treatment of the problem of identity and change is one of them: it is logically the same as that of Leucippus and Democritus. Aristotle said that things are made up of substances, having attributes. The substance is unchanging and so gives a thing its identity over time, while the attributes may change and so allow both identity over time and change in one thing.

The fallacy in the position of Leucippus, Democritus, Lucretius, Aristotle and most subsequent philosophers is that identity over time — oneness — is a property of the whole of a thing. If a part of a thing has identity over time it does not follow that the whole of it does. To suppose otherwise is to commit what is called the fallacy of composition. This is the fallacy of supposing that what is true of a part of a thing is true of the whole. To suppose that because part of a thing is blue, the rest of it must be blue, is an instance of this fallacy. If,

furthermore, you know that another part of this same thing is red, then you know that the whole *cannot* be blue. We should say that the whole is partly blue, but not wholly blue. In the same way, if part of a thing has identity over time it does not follow that all of it has identity over time; and furthermore, if a part of it, no matter how small, does not have identity over time then the whole does not — so if a part changes then the whole of it *cannot* have identity over time. We should say that parts of the whole have identity over time but the whole does not.

Blue and red are incompatible: what is red cannot at the same time be blue, nor what is blue be red. And, as we have proved, identity over time and change are incompatible: what has identity over time cannot change and what changes cannot have identity over time.

One might try to argue that if something is purple then it is red and blue at once, or that a red object with blue polka dots is red and blue at once. But these are only sophistries, mere tricks of language. What is purple all over is neither red nor blue, it is purple; it is correct to say that the purple is caused by mixing red and blue pigments, but to claim that an effect is identical with its cause is a serious error. And blue polka dots are only blue, while their red background is only red, so that the object is partly blue and partly red. What is partly red is not necessarily wholly red, and what is partly blue is not necessarily wholly blue; but what is both partly red and partly blue *cannot* be wholly red, nor wholly blue. In the same way, what partly has identity over time and partly does not cannot wholly have identity over time.

Another way of looking at this is by means of the concepts of distributive and compositional properties. A distributive property is a property which, if a whole has it, then the parts of the whole have it. For example, if a whole exists then all of its parts exist; if a whole is a true copy of something else then all of its parts are true copies also; if a whole is in this room then each of its parts is in this room; and if a whole is possible then each of its parts is possible. The opposite of a distributive property is a compositional property. A compositional property is a property which, if a part has it then so does the whole. For example, non-existence is a compositional property: if a part does not exist then neither does the whole, although another part of the whole may exist; if a part is not a true copy then neither is the whole, although another part of the whole may be; if a part is not in this room then the

whole is not in this room, although a part of the whole may be in this room; and if a part is impossible then so is the whole. Distributive properties and their opposite compositional properties are mutually exclusive: if something has one then it cannot have the other. Thus something cannot at once both exist and not exist, or at once be a true copy and not a true copy. The significance of this is that identity through time is a distributive property: if the whole has it, then so does every part; and change is its opposite compositional property: if a part changes then so does the whole. So if a whole has identity through time then every part has identity through time, in which case no part can change as long as that identity exists; while if any part changes, the whole changes and so the whole cannot have identity. The logic of this applies as equally to *atom* and *arrangement*, and to *substance* and *attribute*, as it does to *whole* and to *part*. Atoms and substances are parts of wholes, as are arrangements of atoms and attributes, so the wholes do not have identity over time unless every atom plus the arrangement of them have identity over time, or the substance plus every attribute of it have identity over time; and if any arrangement or attribute changes then the whole changes — which requires that neither have identity over time.

A partial solution to this problem has come about with Einstein's theories of relativity, in which space and time are replaced by a four-dimensional space-time. We cannot imagine four dimensions (although mathematicians can think them) so a simplification is needed: suppose that objects are two dimensional, and our third dimension is time. It is as if your life were a long movie film, each frame of the film containing the two-dimensional you at a particular instant of time. You can imagine the film actually cut up into separate frames and stacked together, in order. Your whole life would then be one three-dimensional object, one stack of frames, of which one temporal end is the start of your life and the other temporal end is your death. As, from a hypothetical god's eye view, we move our eyes along this three-dimensional object from the beginning, we see later and later moments of your life. Each momentary you — each frame — differs qualitatively from the ones next to it — the earlier one and the later one — so your life is in constant change and there are as many of you as there are frames in the film. In this way you have change but no identity over

time. But equally there is a sense in which you do not change and do have identity: the whole film, as a whole, is unchanging and is one, has identity. The whole contains, as parts, every momentary you and every relation of change between each of these. These parts and relations are all unchanging, from the god's eye view: each momentary you and each relation of change is fixed, eternal, and unchanging.

In the theories of relativity your body is three-dimensional, spatially, rather than two-dimensional, and the time dimension is a fourth dimension. A spatial point extended through this time dimension Einstein called a world-line. The term 'world-tube' is sometimes used to describe an assemblage of world-lines. What, in the two-dimensional analogue, was called the whole film is here a world-tube. Your whole life is one world-tube, having identity and never changing. Any three-dimensional spatial slice of this world tube is you — your body — at a particular time; each such momentary you has its own identity and is unchanging. But between each of your adjacent momentary bodies is a relation of qualitative difference, and a temporal relation of later than, hence a change; and your momentary bodies, and the changes between them, are many. Yet the totality of these momentary bodies has identity, and does not change.

This is an incomplete solution to the problem, because it does not explain why we all have the common sense belief that we are each of us one person travelling through time, rather than one person stretched out through a time dimension. We will return to this difficulty later. For now it is enough to understand the illustration: the problem of identity and change is a piece of reasoning which shows a common sense belief to be false; and the history of ideas shows both sophistical and philosophical attempts to deal with it. The common sense belief, like all false common sense beliefs, has the great advantage of simplicity, which is why it is supported by so many sophists; but it cannot be true.

We have now begun the journey towards wisdom. You are promised a roller-coaster adventure of ideas, with sickening swoops as your false beliefs are exposed and exhilarating climbs as your understanding becomes increasingly unified and profound.

3: Five Realities

We begin with some definitions. In particular, we want to distinguish the five meanings of the word *real*. Reality, after all, is what makes true beliefs true, so we need to know what the word means.

First is the usual philosophers' definition: the real is anything that exists independently of being perceived. That is, if it exists regardless of whether anyone is perceiving it or not, then it is real. Sometimes this definition is broadened slightly, to make the real anything whose existence is mind independent: that is, independent of all consciousness rather than independent of perception. Clearly, according to this definition, such things as dreams, illusions, and hallucinations are unreal. The best known example of a philosophical problem concerning this definition of reality is Bishop Berkeley's problem of the tree which falls in the forest when there is no one around to hear it: does it make a sound or not? If it does, such a sound is real, and if it does not, the sound that someone would hear if they were present, is unreal. This problem shows the curious fact that although we believe that most of what we perceive is real in this way, we are quite unable to prove it. Normally our only proof of existence is empirical: we have to perceive something in order to prove that it exists. So to prove that something exists when it is unperceived requires that it be perceived while unperceived, which is impossible. We will discuss this problem later, but may note in the meantime that because this kind of reality is imperceptible in this way it is appropriate to call it *theoretical reality*, since *theoretical* means non-empirical, and *empirical* means perceived, or known through the senses. Theoretical reality, or mind-independent existence, is the most important of the five senses of the word *real*, so when this word is used without qualification this will be the sense intended.

The second definition of *real* concerns the reality that we perceive around us, and so it may be called *empirical reality*. Not all that we perceive around us is real. For example, what is irremediably private is unreal: after-images, spots before the eyes, hallucinations, and the like are all judged to be unreal simply because they are private. This is because what is wholly private is generally believed to be all in the mind, hence mind-dependent, hence unreal. If you are hallucinating and see a giant furry worm coming into the room, you are likely to warn

everyone else in the room by yelling: “Watch out for that giant furry worm!” But your friends will see no worm, and will say so; and everyone will agree that the worm, being private to you, is all in your mind and so unreal. Even you will agree with this, unless you are convinced that your friends are all lying when they say they see no giant furry worm.

Other unrealities that we perceive around us are illusions. We are universally agreed that illusions are unreal, because illusions are empirical contradictions: contradictions between two different senses, or else contradictions between what is perceived, on the one hand, and well established beliefs about the world, on the other. Since no contradiction can be true, an empirical contradiction must be unreal. Thus the half-immersed stick that appears bent to the sight is a contradiction between two senses when you run your fingers down it and discover that it is not-bent to the touch while it is still bent to the sight; and the seemingly equal size of the Sun and the Moon during a solar eclipse is a contradiction between what we perceive and well established scientific belief concerning the relative real sizes of the Sun and the Moon.

So we have two criteria for empirical reality. What is *public* is empirically real, and what is empirically contradictory is empirically unreal. Sometimes these seem to conflict, since some illusions are public. The railway lines that seem to meet in the distance, for example, do not really meet, hence this seeming meeting is an illusion; but a whole group of people could be looking at a set of railway lines and agree that they seem to meet in the distance, hence this illusion is public to everyone in this group. However, it is not universally public, since other people, standing where the lines seem to meet, would report that they do not meet there — instead, they seem to meet where the first group of people are standing. So public illusions are corrected by greater publicity. Thus our criterion is not merely publicity: it is universal publicity. And there is still a further qualification, since one person alone in the forest would hear the tree fall, but this would be private — as it would be if two people were there but one was totally deaf. Yet we would want to say that this private sound was empirically real. So universal publicity does not have to be actual, it only has to be potential.

3: FIVE REALITIES

So the empirically real is defined as all that we perceive around us that is potentially universally public.

This kind of publicity is far more important than is generally realised. It is, in short, our guide to empirical truth, our guide to what we call fact. This is shown by the importance of publicity in empirical science, which yields more and better truth about the world around us than any other human activity. Over time, by trial and error, empirical scientists have discovered three criteria for good empirical science. These are: (i) scientists must be objective; (ii) quantitative data are better than qualitative data; and (iii) experiments must be repeatable. Each of these is justified by the fact that it is based upon potentially universal publicity. Thus objectivity is attention to the public, as is obvious as soon as it is understood that its opposite, subjectivity, is attention to privacies — such as personal wishes, vanity, or desire for one's own glory. Also, quantitative data happen to be more public than qualitative data. And repeatability of experiments is the requirement that experimental results be public. In fact, the importance of publicity in science goes beyond empirical science. Thus the probability of laws and theories in science is established through consensus of scientists, which is publicity of judgment. And reason, our second criterion for truth, is the most potentially universally public content of minds. Finally, Einstein's principle of relativity, from which he deduced his two theories of relativity, is the principle that the basic laws of science must be true for all observers, no matter how they are moving relative to each other — which is to say that the laws of science must be potentially universally public.

The third meaning of *real* is *true*. This is seen most clearly when it is used in the opposite sense: the unreal is false. We often say of someone's set of beliefs or of their world view that it is unreal, meaning that it is false. Also, we say of a bad portrait that it is unreal, meaning that it is dissimilar to its original. Thus truth and falsity in this context are similarity and dissimilarity to an original. The origin of this usage is a naive common sense mis-identification: the true is true by virtue of being similar to reality, and this similarity is assumed, falsely, to be identity; so the true is made identical with the real. The word *same* can mean both *similar* and *identical*, as we have seen, and so may be used to equivocate sophistically between these two meanings: "This

is true, so it is similar to reality, hence the same as reality, therefore identical with reality, and so real."

The fourth meaning of *real* is *genuine*. We speak of real flavours as opposed to artificial ones, meaning that they are genuine. So also, in these days of cheap substitutes and fakes, do we speak of real leather, real wood, real linen, and the like, meaning *genuine* in each case. We will not be concerned with this meaning: it is mentioned only for clarification.

The fifth meaning of *real* is also mentioned only for clarification: it is the legal meaning of immovable, as in *real estate*.

Thus we have the five meanings of the word real: existence independently of being perceived, all that is potentially universally public, the true, the genuine, and the immovable.

The first three meanings of *real* are all interrelated. To begin with, all illusions are explained in terms of images: a causal process of information transfer brings an image of an object into the brain of the perceiver, and if this image is false then it is illusory. Such falsity is the falsity of dissimilarity to the real, as the bentness of the half-immersed image stick is dissimilar to the straightness of the real stick. Thus illusions are unreal in the sense of being false. They are also unreal in the sense of not being empirically real: they are not potentially universally public. The empirically real — what we perceive around us that is public — on the other hand, is generally believed to be theoretically real — it continues to exist when we stop perceiving it. When you leave home for any reason, for example, you believe that your home continues to exist while you are away and do not perceive it. This belief that the empirically real is theoretically real is known as naive realism.

4: Naive Realism

In the past there were two kinds of false beliefs about identity which we now know to be quite naive. One was name magic, in which name and named were regarded as one. So a spell directed at a particular person had to contain that person's name. A defence against this was to have a secret real name and an everyday false name. The second naive belief was sympathetic magic, in which a symbol was identified with what it stood for. The best known case was a doll simulacrum, a voodoo doll, into which pins could be stuck so as to injure the person symbolised. In each case identity was inferred invalidly. Name and named are two, they cannot be one; and doll and person are two, they cannot be one. This is because name and named are qualitatively different, as are doll and person.

It is important to appreciate the naivety of these two beliefs, because there is a third, precisely analogical, belief which is a part of present day common sense. It is naive realism, the belief that images of real objects are identical with their originals, the real objects. The real objects are theoretically real and the images of them are empirically real — provided that they are potentially universally public; and since the images differ qualitatively from the real objects, they cannot be identical. Discovery of the naivety of naive realism produces a belief shock. It is such a severe shock, in fact, that most people rebound from it into sophistry. So we will approach this topic circumspectly.

I will first state, baldly, a number of points about naive realism, and then go on to examine them in detail.

Naive realism is one of the main foundations of any common sense world view, and it is false. It is one of the beliefs that must be corrected in order to reach the profound. To understand why naive realism must be false, and in what way it is false, and what its corrected form must take, is not easy. It requires understanding that *everything* we perceive — both the illusory and the non-illusory, and the public and the private — is images. All are private to the person concerned, in the sense of being private to that person's consciousness, although some may be public by similarity, in the same way particular copies of newspapers and particular viewings of television programs are public; and some are true by similarity, hence real (in our third meaning of the word *real*), and some are false by dissimilarity, hence unreal. But much

more difficult than understanding all this is to understand *where* all these images are. We will come back to all of these points shortly.

The correction of naive realism is the most difficult of all the corrections to common sense that you will meet in this book. So if you want to avoid lapsing into sophistry, the very least that you should do in what follows is to practice a willing suspension of disbelief.

There are five simple arguments for naive realism — for saying that everything public that we perceive around us must continue to exist between occasions of it being perceived — and three for saying that everything we perceive must be images of reality; and each of these eight arguments applies to everything we perceive, not to some of what we perceive, so they all imply that we cannot perceive a mixture of reality and images. We are going to have to decide which arguments are sophistical and which are philosophical.

In order to examine these eight arguments we need two more definitions: there are two meanings to the word *perception* that must be distinguished.

Perception as we all know it in everyday experience may be called *empirical perception*, simply because we know it empirically. In empirical perception we perceive objects external to ourselves[1], such as tables and chairs, houses and gardens; that is to say, we are directly conscious of external objects. We also perceive other people and, unless they are all extraordinarily consistent liars, they perceive the *same* objects that we do when they are in the *same* vicinity — and this makes these objects public. It is also characteristic of these objects that they are usually reperceptible: when we return our perception to them after an interval, we perceive them again — as we re-perceive our homes when we return. Each time we return to our bedroom, for example, the bed is perceived again, even though it was not perceived all the time we were away. This reperceptibility is not universal: our house may have burned to the ground, so that the bed is never perceived again; but for most objects reperceptibility is much more common than not. Another feature of empirical perception is that what we empirically perceive is causally coherent: things generally continue

[1] For the sake of simplicity we will exclude from empirical perception all *internal* perceptions, such as physical pains and pleasures.

to behave as they have behaved in the past, so that we can rely on our common sense expectations. When we flick the switch the light comes on, when we boil the potatoes they cook, when we dial a phone number we talk with the person we want to, provided that they are available. Not only this, but this causal coherence continues when unperceived: if we put potatoes on to boil and then go away for twenty minutes, then when we return we find that the potatoes have become cooked in our absence. Finally, it is characteristic of things empirically perceived that they resist our wills, in a way that daydreams and fantasies do not. We can dream of spending a fortune won in a lottery, but empirical lottery tickets are quite resistant to our will of winning such a fortune. This distinction is sometimes made the basis for defining the *material*, which resists the will, and the *mental*, which does not.

These features of empirical perception — externality, publicity, reperceptibility, causal coherence, and resistance to the will — each form the crux of one of the five arguments for naive realism: for the theoretical reality of empirical reality. We shall examine these five arguments in a moment.

Secondly, we can define *theoretical perception*, which is the scientific explanation of empirical perception. Theoretical perception explains vision, for example, by means of electromagnetic radiation being reflected from real, external, objects and forming optical images on our retinas, which images are then converted into neural impulses and sent into the brain. Different frequencies of this electromagnetic radiation produce different colour sensations in the perceiver, and since different molecular structures in the object reflect different frequencies, we see objects of various colours. This electromagnetic radiation can also have its direction of travel changed, and we thereby explain reflections in mirrors, enlargements in microscopes and telescopes, the seeming bentness of the half-immersed stick, and other optical phenomena. Theoretical perception also includes the perception of sensations of sounds when sonic waves of the right frequencies vibrate our eardrums; tactile sensations such as hot and cold, hard and soft, solid and liquid, heavy and light, and electric shocks, by stimulation of the appropriate tactile nerve endings; and smells and tastes by interaction of molecules with the nose, tongue, and palate. What is here called theoretical perception is usually referred to by contemporary

philosophers as the causal theory of perception, because it describes a theoretical causal process of information transfer from the real object to the brain of the perceiver.

Notice that common sense does not usually distinguish between empirical and theoretical perception: instead they are identified, since otherwise naive realism would become incoherent. But they cannot be identified, because they are qualitatively different, and qualitative difference entails quantitative difference. There are at least two qualitative differences between them. One is that theoretical perception is a causal process while empirical perception is not a process, it is an immediate awareness; and the other is that theoretical perception has a duality of object and image while empirical perception does not have this duality: we are not conscious of object and image in empirical perception, only of object. (A memory is an image of an empirical object, but the memory is not the image of theoretical perception, since in theoretical perception a memory is an image of an image of an object.)

The five arguments for naive realism — the claim that all that we publicly perceive continues to exist when unperceived, or, equivalently, that the empirically real is theoretically real — go as follows.

First, the objects that we empirically perceive — empirically real objects — are all external to ourselves. According to theoretical perception, real objects outside the perceiver produce images inside the perceiver. More specifically, the objects are outside the perceiver's head and the images of them are inside the perceiver's head, in his or her brain. So since what we empirically perceive is clearly outside our heads, not inside, it must all be real objects, not images of real objects. In other words, empirically real objects are theoretically real.

Second, these empirically perceived objects are public, so somebody else may perceive them when I am not perceiving them, which proves that they exist independently of my perception, hence they are theoretically real. Also, what is public is not private, and images in my head are private, so what I empirically perceive is not images, since it is public.

Third, the most obvious explanation of the fact that empirically real objects are reperceptible is that they continue to exist all the time

between occasions of their being perceived, which means that they exist independently of perception and so are theoretically real. If the potatoes cooked during the twenty minutes that I was away, they must have existed unperceived during this time and so are theoretically real.

Fourth, the causal coherence of empirically real objects is quite distinct from the incoherence of dreams, hallucinations, delirium and even fantasies. We can claim that all these latter things are unreal — images, that is — because of their causal incoherence, and hence what is causally coherent is not images, but reality itself.

Fifth, what we perceive around us is material, rather than mental, and so real. The common sense distinction between matter and mind is best defined by saying that matter resists the will, where mind does not. Thus we may will to levitate, or to win the lottery, or to look young again, but these things obey empirical laws, not our will. But mentally we may in our fantasies have whatever we want: riches, fame, glory, power, knowledge, youth, sex appeal, or whatever: our daydreams do not resist the will. What we perceive around us resists our will, so is material, so is real. An alternative definition of *material* and *mental* is the material has weight and the mental does not; so, since external objects have weight, they are material and so real. This is the weakest of the five arguments, since the distinction between matter and mind does not stand up to detailed analysis. For example, our state of mind resists the will, but is not thereby material: we can will to be happy when depressed, or to continue loving when love has ended, or to be unafraid when fear is overpowering, or to endure when at the end of the tether, and these clearly mental states resist such willing. On the other hand, illusions are unreal, so immaterial, so mental, yet they resist our will equally with the non-illusory matter around them: the bentness of the half-immersed stick should be mental, even though the stick itself is material. (There is an old philosophic joke: What is matter? — never mind; what is mind? — no matter.) None the less, this argument does have some cogency, and is offered here for the sake of completeness.

All of these five arguments conclude that the empirically real is theoretically real: what we perceive around us that is potentially universally public continues to exist when unperceived because it exists independently of mind. Thus if the five arguments are valid then naive

realism is true. They seem valid to common sense, but unfortunately they are not valid, they are sophistries.

5: Metarealism

Metarealism is the belief that the real world exists but that we never perceive it — we only perceive images of it, brought to us by theoretical perception. 'Meta' means beyond, so metarealism is the belief that reality is beyond the empirical.

The first argument that all that we perceive is not reality but images of reality depends upon the fact of illusions. For example, if you watch a car driving away from you on a straight road, then the farther away it gets, the smaller it appears to be. You can stick up your thumb at arm's length, like a landscape painter, and the car gets smaller relative to your thumb. We know that the car does not really get smaller, it only appears to get smaller. So we have to distinguish two cars: the real car, which does not get smaller, and the apparent car, which does get smaller. They have to be two, because they are qualitatively different: one is smaller than the other. We explain the illusion of diminution with distance by saying that the optical image, on the retinas of our eyes, gets smaller with the greater distance of its original, the real object. So the real car has a constant size and the apparent car, or image car, gets smaller with distance. The question now is: which do we actually see, the real car, or the image of it? The answer is easy: what we see gets smaller with distance, and so what we see is the image; it cannot be the real car, because the real car does *not* get smaller with distance.

But everything we see varies its size with distance, so everything we see is an image of reality, not reality itself.

There is only one possible explanation of illusions: they are images. (We do not have to use the word *image* here: other possible words are *reproduction, replica, copy, duplicate,* or *facsimile*; but we will use *image* for simplicity.) Illusions are images because illusions are false perceptions. The distant car appears smaller than your thumb, but this appearance is false: the car is really large enough for you to get into. But reality cannot be false, any more than it can be contradictory, because reality is the basis of truth: only an image of reality can be false, by being an inexact copy of reality. An image is true if it is exactly similar to its original, and it is false in so far as it is dissimilar to its original. Such similarity and dissimilarity are a matter of degree, so this kind of truth and falsity are a matter of degree also. This kind of

truth is our third meaning of *reality*, not to be confused with theoretical reality and empirical reality.

Next, it is a fact that *everything* we empirically perceive, with any of our senses, is illusory to some degree. If you want to claim that this is not so then try to perform two tasks: (i) point to some empirical object that is wholly non-illusory, and (ii) explain how you know it to be so.

The difficulty of the first task is shown when we consider how much of what we see is illusory. Thus visual size is hardly ever, and perhaps never, non-illusory because visual size diminishes with distance. This is why the distant railway lines seem to meet: the spacing between them diminishes with the distance. So we distinguish between apparent size, which changes with distance, and real size which does not. (An interesting puzzle is to ask yourself what distance an object has to be for you to see its real size: at what distance is its apparent size equal to its real size? Or, how far away must a metre rule or a yardstick be in order for you to perceive a real metre or a real yard?) Visual shape is also almost always illusory because of perspective, as with the round plate seen as oval unless seen head on. And it is not only vision that gives illusions: if you cross your fingers and roll a pencil between them, your touch tells you that there are two pencils; and Plato gave a famous example of illusory taste, namely, of wine that tastes sweet to a healthy man and sour to a jaundiced man.

It is true that we hardly ever are deceived by these illusions, because we learned when very young to correct them; such correction is automatic and unconscious, and gives a much less illusory view of the world. This allows us to say that what we perceive is as a result more real, perhaps even wholly real; but only in the second and third of our senses of *real*, the senses of potentially universally public and of truth by similarity to an original. But it is equivocal to suppose from this that correction of illusions makes our perceptions real in the first sense of *real*, the sense of existence independently of being perceived. Indeed, if the illusoriness of something can be corrected by increasing its similarity to its original then it must be an image, cannot be the original itself.

The difficulty of the second task — how to prove that some perceived object is wholly non-illusory — is due to the fact that we

know illusion when we detect an empirical contradiction between two senses, or a contradiction between what we perceive and a well established belief. Such contradictions guarantee illusion but absence of such contradictions in no way guarantees non-illusion. Empirical contradiction is like a flag that illusions carry with them, which proclaims that they are illusions; but non-illusions carry no flag and so cannot be recognised as non-illusions. An analogy would be a newspaper report on events in a distant land that you cannot visit: if the report is self-contradictory it is certainly false, but if it is self-consistent then it may or may not be true — and you cannot find out which. Another parallel occurs with both memory and history: no one can visit the past to verify either memory or history, so their truth cannot be known, although their falsity can be known if they are self-contradictory. We have a criterion for empirical truth, to be sure: potential universal publicity; but this does not guarantee truth, it only makes it more likely, as will be explained later.

It follows that if everything we perceive is at least a little bit illusory then everything we perceive must be images of reality, not reality itself.

The seeming implausibility of this argument that all that we perceive must be images is that it proceeds from the claim that what is perceived is *partly* illusory to the claim that it is *wholly* an image; or, what is equivalent, that being an image is a necessary condition for any degree of illusoriness. It seems obvious to anyone of common sense that what we perceive may be a mixture of image and reality: in so far as it is illusory, it is an image, and in so far as it is non-illusory it is reality. For example, if we perceive a glass of water with a spoon in it, and at the surface of the water the spoon appears bent because of refraction of light, we would normally say that the spoon, the glass and the water are real, but the bentness of the spoon is an image. Or what is perceived may change its status from reality to image and back again, as in the case of double vision when the eyes are crossed. We explain this by saying that we receive two visual images, one per eye; when the eyes are aligned these images coincide, but when the eyes are misaligned the images do not coincide and our vision is doubled. So according to common sense, if you are holding this book and cross your

eyes, you see two images of this book, while if you uncross your eyes you do not see one combined image — you see a real book.

However, this belief that we perceive a mixture of reality and images of reality does not bear scrutiny, as an analogy will show. Examples of other kinds of images are photographs and television pictures. Is it conceivable that a person could be partly a real human being and partly a photograph of himself? Or partly a real human and partly a television picture of herself? The absurdity here is having a mixture of "stuffs": the stuff of a real human being is biological cells, the stuff of a photograph is grains of silver and the stuff of a television picture is spots of light. We do not know what is the "stuff" of the mental images that constitute illusions, but it is hardly credible that it could form a compatible mixture with the stuff of reality. Merely to point out that it would be a mixture of the mental and the material makes this clear.

Another analogy will also help to clarify the claim that what *may* be illusory *must* be an image. Suppose that there is a room full of people and you know nothing about them except for that fact that all of them *might* be pregnant. You then can infer immediately that all of them *must* be women. The possibility of pregnancy entails the necessity of being a woman, and the possibility of being illusory entails the necessity of being an image. We do not suppose that all these people *are* pregnant, only that they *could* be; and we do not suppose that everything you see *is* illusory, only that it *could* be. And because it *could* be illusory it *must* be an image.

The second argument that all that we perceive is images of reality rather than reality itself comes from the fact of secondary qualities. First defined specifically by John Locke (1632-1714), who distinguished primary qualities and secondary qualities in that primary qualities are qualities of real objects while secondary qualities are not. Secondary qualities do not exist in real objects — only the powers to produce them do. Secondary qualities are sensations: colours, sounds, tastes, smells, and tactile sensations, all of which are manufactured in the sense organs at the earliest, but more probably in the brain of the perceiver. They are variable, and depend to a large extent upon the health, age, etc. of the perceiver. Primary qualities, on the other hand, are not variable in this way: Locke listed six of them: solidity,

extension, figure, motion, rest, and number. He probably had in mind the fact that these can be measured, unlike tastes and smells, and so are objects of science, and so real.

Consider colour. This word has three meanings: a visual sensation, the electromagnetic radiation that produces that sensation, and the molecular structure that produces that radiation. Thus if you look at a green leaf, the colour of green is caused by molecules of chlorophyll reflecting electromagnetic radiation in the "green" portion of the spectrum; this produces a two-dimensional optical image on the retina of each eye, and each image is transduced into a neural image and sent into your brain, where the two images are combined into one three-dimensional image which is *green*. This *green* is a secondary quality, a sensation, manufactured in your brain. (A problem for naive realists is to say where this *green* is: theoretically, it must be inside your head, yet when you see a green leaf it is indubitably outside your head, in the leaf.) Also, quite clearly, what is manufactured in any perceiver in this way exists only as a result of perception, hence does not exist independently of perception, hence is not theoretically real; so the green leaf that you see is not real in this sense.

This is true of all sensations: sounds, including their loudness, pitch and timbre; tactile sensations, such as hard and soft, hot and cold, and rough and smooth; tastes; smells; and forces that affect us, such as weight and inertial forces. This is not to belittle secondary qualities: we cannot manage without them, for they give us all kinds of information. The green leaf that you see has a certain size and shape, and the *green* tells you what they are. But philosophically it is inescapable that secondary qualities are in your brain, and unreal.

As a small digression, philosophers usually call secondary qualities *representations* of reality, rather than *images* of reality, since they are so unlike their originals. Your sensation *green* is quite unlike chlorophyll molecules, for example, but the size and shape of the leaf that you see are probably fairly true, and so images of the real leaf.

Next, if you think about it, everything you perceive is composed of secondary qualities. Every empirical object, every object that you empirically perceive, is a structure one or more secondary qualities, and your entire perceived world is a structure of empirical objects. So none of it is real, it is only representations and images of reality.

BELIEF SHOCK

Let us now consider the third argument for all that we empirically perceive being images of reality, rather than being reality itself. We begin with a specific case, and then generalise it.

Suppose that you and I are looking at a house together. Suppose that the house faces south, and that you are looking at it from the southwest, so that you see the front and the west side, while I am looking at it from the southeast, so that I see the front and the east side. Clearly, the house that you see differs qualitatively from the house that I see, therefore the house that you see and the house that I see differ quantitatively — because qualitative difference entails quantitative difference. So they must be two houses: your empirical house and my empirical house. Furthermore, the house that each of us sees is somewhat illusory — it is coloured, for example, and such colours are secondary qualities, which we have no reason to suppose that real objects possess — hence our two houses differ qualitatively from the real house and so differ quantitatively from it. So we have three houses: yours, mine and the real one. This conclusion is inescapable, and the only way to explain it is to say that our two houses are images of the real house; indeed, they have to be images because they are partly illusory. The common sense way of dealing with this problem is to say that we each perceive a different *aspect* of the house, and that to see an aspect of something is to see that thing itself. But this last point is impossible; the aspect differs qualitatively from the thing itself and so cannot be identical with it. And if you think carefully about what an aspect is, you find that it can only be an image; and since we only ever see aspects of three-dimensional objects, we only see images.

This argument is generalised as follows. We define your empirical world as all that you empirically perceive around you, my empirical world as all that I empirically perceive around me, and the real world as all that is theoretically real. Recall that empirical perception is all perception as we know it from personal experience — as opposed to theoretical perception, which is the causal theory of perception, the scientific explanation of empirical perception — and that the theoretically real is all that exists independently of being perceived. Then your empirical world and my empirical world differ qualitatively from each other, because of viewpoint, perspective, and perceptual idiosyncrasies, and so must be two. And each of these two

worlds differs qualitatively from the real world, because of illusion, and so differs quantitatively from it. So there are as many empirical worlds as there are perceivers, and none of these empirical worlds are the real world; each of them is only an image of the real world.

Thus we have the three arguments that what we perceive is not reality but only images of reality: a conclusion which is philosophical and clearly contradicts common sense. To summarise: everything we empirically perceive is images of reality rather than reality itself because (i) it is illusory to some degree, (ii) it is composed of secondary qualities, and (iii) it is qualitatively different both from what everyone else perceives, and from reality.

6: Some Sophistries

There are various well established, common sense, ways of dealing with this difficulty of the contradiction between naive realism and the facts of perception, illusion, and secondary qualities. They are all sophistries, introduced in order to provide an appearance of verisimilitude in a seemingly logically impossible position, so that naive common sense belief may be preserved in the face of reason.

One of these sophistries uses the concept of *projection*. It is supposed that what we see is real, and that we somehow project an illusion — a false image — on to it. As a result what we see is a mixture of reality and image. This usually takes the form of supposing that the real object and the image of it are in the same place: the object is out there, where we can point to it, and the image is projected on to the surface of it. For example, if we see a ripe tomato its redness is a secondary quality, a sensation, manufactured in our brains as a result of electromagnetic radiation of the right frequency[2] landing on our retinas; so we project this redness out on to the surface of the real tomato, a surface composed of molecules which are red only in the sense of reflecting electromagnetic radiation of the appropriate frequency, and so we see the real tomato as red. That this is a sophistry is clear at once when it is asked *how* we manage to do this projection. We do not project optically, as slides and movies are projected on to a screen, by means of a light behind them, nor do we project mechanically, as stones are projected from a slingshot or shells from a cannon, nor do we project geometrically, as our shadows are projected onto walls and the ground. But the word *projection* has no further meaningful process. Secondly, if projection really did occur then what was projected on to a public object would have to be public also, as the picture projected optically on to the screen is public: according to naive realism, external objects are public simply by virtue of being in public space, so that the projected illusion, having been projected into public space, should be public. But although some illusions are public, many of them are not. After images, the blurredness of objects seen with unfocused eyes or while wearing someone else's glasses, and the distortion of colours

[2] Somewhere in the range 380-480 terahertz, where a terahertz is 10^{12}, or a million million, cycles per second.

seen through coloured glass are all examples of private illusion. If the man looking through green glass saw reality as green because of genuinely projecting greenness on to reality then everyone around him, even though not using green glass, should see it as green also. A third problem is that although projection seems to explain the existence of secondary qualities such as colours on the surface of real objects, it cannot explain other illusions, such as visual size getting smaller with distance. The image gets smaller with distance, to be sure, but the real object does not; so how can a small image be projected on to a large object so as to make the large object appear small?

A second sophistry is the claim that what we perceive is reality but we perceive it *by means of* images, and the images introduce the illusion. As an explanation this is empty unless these *means* are spelled out. It is no better than claiming that we can levitate or make ourselves invisible because we can do it *by means of* the will. Explaining by use of the phrase *by means of* is legitimate only if the means are spelled out, as in explaining how we can talk with distant friends by means of the telephone, or cure some diseases by means of antibiotics: in each case we are able to say how the means work. But when the means cannot be spelled out, the attempt at explanation is vacuous. A variation on this *by means of* approach is to say that we see the real object *through* the image, and thus see both. This supposes that the image is something like a dirty window, so that in looking through it we see both the dirt and the view beyond. But the analogy is false: it is like saying that a television picture is a window through which we see the actors in the television studio; the falseness of this is shown by the case of a video-taped program. Our eyes are no more like windows than are television-cameras-cum-receivers. If we watch a movie of which the star is now long dead, are we seeing the star, or an image of her? And if we see an animated movie, manufactured on a computer, where is the reality of what we see? If you watch a cartoon rabbit enter a hollow log and then come out from the other end, does the rabbit exist while supposedly in the log?

A third sophistry is to speak of *indirect perception*, which is based on the distinction between cause and effect. It is supposed that whenever we directly perceive an effect of something, we indirectly perceive its cause. By direct perception is meant what is here called

empirical perception, in which we are directly conscious of external objects. Since theoretical perception is a causal process, in which a real object causes an image of itself in the perceiver, we supposedly perceive the image directly and the cause — the real object — indirectly. There are degrees of indirectness of perception, in that the causal chain may be of any length. If the real object is perceived by means of an image of a photograph, it is more indirectly perceived than if the image of it is perceived directly; and if the photograph is taken through a microscope, the theoretical perception is even more indirect. But however indirect parts of it may be, such perception is a mixture of direct and indirect perception, hence we perceive a mixture of reality and images of reality. This sophistry falls apart once it is understood that the concept of indirect perception is genuinely meaningful only as a synonym for belief. If we empirically see a flash of lightning, for example, we indirectly see an atmospheric electric discharge only in the sense that we believe that flashes of lightning are visual effects, caused by atmospheric electric discharges. Since belief is fallible, so is indirect perception. Because if we indirectly perceive atmospheric electric discharges in lightning, then ancient people indirectly perceived the arrows of angry gods in lightning, and who is to say for absolutely certain whether either discharges or arrows are reality?

7: A Dilemma and Two Nutshells

Far better than any of these sophistries is to say that the mixture in our perception is not a mixture of illusions — false images — and reality, but rather a mixture of false images and true images. There is no difficulty in having composite photographs or composite television pictures — only difficulty in having composites of these with reality. So there is no difficulty in supposing a composite of true and false images. The false images are illusions and the true images are reality in our third meaning of the word: the real is the true. This truth and falsity are the truth and falsity of similarity and dissimilarity, as a true portrait is similar to its original and a false one is dissimilar. The false in perception is illusion, because illusions are empirical contradictions and all contradictions are necessarily false; hence the true in perception is non-illusion, or true images[3]. And as we shall later discover, the true and the public in empirical perception largely coincide, so it follows that what we perceive around us that is potentially universally public is all our true images. And this, by definition, is empirical reality. So if we allow that *all* that we empirically perceive is images, then we can say that we empirically perceive a mixture of illusion and empirical reality. The reason why so many people are appalled by this is that this empirical reality *is not theoretically real*: it exists only for as long as it is perceived, as do all images in theoretical perception. To claim this is to claim the falsity of naive realism.

So, bringing all these arguments together, we have a dilemma: either everything we perceive around us is reality because it is all external, public, reperceptible, causally coherent, and material; or else it is all images because it is all at least a little bit illusory, composed of secondary qualities, and somewhat qualitatively private to each perceiver.

Only the second of these alternatives can be true, because of the fact of illusion, and the fact that, because they are empirical contradictions, illusions are unreal: they do not exist independently of being perceived. Because some illusions are external, public, reperceptible, causally coherent, and material, it follows that the

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[3] Contemporary philosophers do not like to talk about true and false perception: instead they speak of *veridical* and *unveridical* perception. But this is only jargon, invented to give a feeling of solid ground over the tiger trap.

properties of being external, public, reperceptible, causally coherent, and material do not guarantee reality. Or, to be more precise, they do not imply theoretical reality, although they do suggest empirical reality. So we have to say that all that we perceive is images. Hence we have to say that naive realism is false.

In a nutshell, this whole argument is: common sense requires that the world we each perceive around is, somehow, a mixture of reality and illusion; it cannot be this because, among other reasons, reality is outside our heads and illusions, as images, are inside; so it must either be all reality, or else be all images; and it cannot be all reality because some of it is illusory and illusions are unreal; so it must be all images.

In another nutshell, we must choose between two positions: those of externality and illusoriness. The first is that all that we empirically perceive is external and therefore real, hence reality is partly illusory. The second is that all that we perceive is partly illusory, hence images, and so somehow our images are outside our heads, not inside. It is difficult to imagine how images could be external, but not impossible. Indeed, we shall see how, shortly. But it is impossible for reality to be illusory — simply because illusions are unreal. Illusions are unreal because they are contradictory, and reality cannot contain contradictions because contradictions are necessarily false and reality is the ground of all truth. So in choosing rationally between these, we have to choose the possible, because we cannot rationally choose the impossible — namely, that some of reality is unreal.

Let us pause a moment here, even though at this point we seem to be out of the frying pan and into the fire. Pause to remark that the doctrine, that all that we perceive around us is images, belongs to an old and honourable tradition. Plato maintained it, for example. So what is argued here is not some lunatic fringe belief but an ancient philosophical conclusion which, we shall discover, is indeed on the road to profundity. It is the basis of perennial philosophy, which is called this because it is repeatedly rediscovered by independent thinkers. However, the doctrine that all that we perceive around us is images does present some immediate problems: because if all that we empirically perceive is images, then how does it happen that all these

7: A DILEMMA AND TWO NUTSHELLS

images are external, public, reperceptible, causally coherent, and material?

8: Two Heads are Better than One

The explanations of how all your images can be external to your head, public, reperceptible, causally coherent, and material are all logically easy but psychologically difficult, and the first — externality — is the most difficult psychologically. So we will start with that, after which all the others will be relatively easy.

So how can all your images — your empirical world — be outside your head when all images are inside your head? Everything you empirically perceive (remember that, for simplicity, this is with the exception of internal sensations, such as the headache that this quest for wisdom is likely to give you) is quite clearly outside your head, not inside: you empirically perceive it to be so. But theoretical perception requires that all these images be inside your head, not outside.

Some major philosophers of the past — John Locke (1632-1714), Bishop Berkeley (1685-1753), and Immanuel Kant (1724-1804), for example — got about this far in their reasoning and then stumbled. There is some evidence that Plato solved the problem, but his solution is not explicit in his writings. (It is conceivable that Plato learned it from his teacher Socrates, and that it was this anti-common-sensical solution that the Athenians considered the "corruption of the youth of Athens" for which they condemned Socrates to death.) The first solution to the problem is to be found in Leibniz (in his *Monadology*), but Leibniz was sufficiently cautious not to draw attention to it, let alone make explicit what the problem was that it solved. The first philosopher to publish the solution explicitly was Bertrand Russell[4]. Russell was a courageous man, who cared nothing for public disapproval or execration, and published the full logical simplicity of his solution without regard to the emotional reactions of his readers. It is ironic that earlier philosophers, writing in times when such views could cause them to be burned at the stake, suppressed or disguised them; they need not have worried, judging by posterity's treatment so far of Russell. Hardly anyone has understood him, and most of those who have done reject him utterly through simple appeal to common sense. Although it is clear from Russell's writings that he solved this

[4] See his *Human Knowledge: its Scope and Limits*, Part 3, Allen & Unwin, London 1948.

problem for himself, he recognised Leibniz' priority and gave him the credit for it. But since no one else recognised it in Leibniz until Russell, it is quite just to call it the Leibniz-Russell theory.

The Leibniz-Russell theory is the logical solution to the problem of how it can be that everything you empirically perceive is clearly outside your head and hence seemingly real, yet is also necessarily images and so inside your head.

The key point is this: if everything you empirically perceive is an image then *your own perceived empirical body must also be an image*.

As such your perceived head is an image of your real head. We could call these your image-head and your real-head respectively, but better terms are *empirical head* and *theoretical head*. Your empirical head is an image of your theoretical head. The simplicity of the logic of this is that as soon as you have two heads the problem vanishes — and I am not trying to be offensive in calling you two-headed. All that you empirically perceive, which is outside your head, is outside your empirical head; and all that you empirically perceive, which is images of reality, is inside your theoretical head. The problem arises only if you assume that your two heads are one: an assumption that is an identification as naive as that of name and named in name magic.

Consider an analogy: it is impossible for an apple to be both inside and outside one box at once; but if you have two boxes, one inside the other, with the apple between them, then you can say, truly but ambiguously, that the apple is at once inside the box and outside the box: because it is inside the outer box and outside the inner box.

So according to the Leibniz-Russell theory you have two heads, one inside the other and your empirical world between them. The full impact of your emotional horror of this is realised when you ask the location of your real or theoretical head. This is the head that contains all your empirical world, all your images. Since all these images are inside your theoretical head, it follows that your theoretical head is outside your farthest image. So if you go outside on a sunny day then beyond the blue sky is the inside surface of your theoretical skull.

This is the biggest belief shock in this book: all others are smaller after shocks. If you have not met it before, then at this point you should probably stop reading for a while — a rest is helpful after a belief shock!

9: Leibniz and Russell

G. W. Leibniz (1646-1716) created a philosophical system which is very logical and hence very strange — until you understand it as a whole. He believed that there are no real relations, such as space, time, similarity, and causation; all of these are, he claimed, *entia rationes*, mere fictions manufactured unconsciously by the mind. His reason for this was his belief that the rationality of reality had to be the logic of Aristotle, and Aristotle's logic cannot handle relations satisfactorily — it is good only for subjects and predicates. The supposed analogues of subjects and predicates in the real world are substances and their attributes. So for Leibniz reality consists of an infinity of substances, which he called monads. (Hence the title of one his most important essays, *The Monadology*.) Each monad is simple: it has no parts, and hence no real relations inside it. Each monad has no size: it is like a point in geometry, and so the infinity of monads occupy no space. Equally, they are timeless, without time. And no two monads are similar: every one of them differs from every other — the characteristic difference being what Leibniz called its viewpoint: so there are no similarities. Each monad is conscious, and what it is conscious of is images of reality, imaged from its own viewpoint. This imaging is not a causal process of theoretical perception — there are no causes — but what Leibniz called a mirroring of reality; this mirroring is an attribute of each monad, and is what here is being called its empirical world — complete with illusions of space and other relations. Empirical objects are mirrorings of what Leibniz called compound substances, which are collections of monads whose viewpoints are close together. Compound substances may be thought of as real objects. Thus you, as a conscious being, are a monad; your mirroring of reality includes your own empirical body, which is an image of your real body, a compound substance. Your real body contains you as a monad, which contains your empirical world which contains your empirical body — although *contains*, as a relation, is not the right word, since no relations exist. The totality of monads is the real world, which exists necessarily, according to Leibniz, because it is the best of all possibles.

Bertrand Russell (1872-1970) used the word *perceptual* for our present *empirical*, and the word *physical* for our *theoretical*; you need to know this if you are going to read him, but for ease of reading here

we will mostly not use his words. He had two versions of his theory, the first being largely incomprehensible to non-mathematicians. In this he said that space is six-dimensional: meaning that any location needed six numbers to specify it. He said that at every point of the three-dimensional physical space there exists a three-dimensional perceptual space. So to locate an empirical object you need three numbers to locate it in perceptual space — such as latitude, longitude, and height above mean sea level — and then you needed three more numbers to locate this perceptual space in physical space. You have a real body in physical space, which can move around in that space, and wherever you are in that space you are conscious of the perceptual space at that point; and this perceptual space is your empirical world. By means of theoretical perception your empirical world contains images, in perceptual space, of real objects in physical space, including your own empirical body which is an image of your real body. Thus your real body contains your empirical world which contains your empirical body.

Russell's later version, in *Human Knowledge*, did away with the six-dimensional space, which, although mathematically neat, is not logically necessary. This new version simply had space inside your real head for your empirical world, which empirical world contains your empirical body — which is essentially the version given in this book.

This should help make clear that Leibniz' and Russell's two heads are better than the one head of common sense.

10: Four More Problems

We now turn to the four other problems concerning images: how are they public, reperceptible, causally coherent, and material?

First, if you and I are both theoretically perceiving one real object, then we will each empirically perceive our own private image of it. But the images will be largely similar, and thus they will be public by similarity, even though not public by identity — just as television pictures, of the same program but on different sets, are public by similarity but not by identity.

There are two kinds of publicity, and two kinds of privacy: publicity by similarity and its opposite privacy by dissimilarity; and publicity by identity and its opposite privacy by plurality. Publicity by identity is the publicity of common sense belief: if some object is public to several perceivers then they are all conscious of *one and the same* object, according to common sense. (This is the *simplest* explanation of publicity.) So if all that we perceive is images then this common sense belief must also be false: we each of us empirically perceive his or her own, numerically distinct, private by plurality empirical world. Each such empirical world is composed of images and is public by similarity to some extent by virtue of similarity to other such worlds; thus empirical worlds can be both images and partly public.

Second, the reperceptibility of these images is accounted for by the fact that their originals, the theoretically real objects, continue to exist between occasions of their being theoretically perceived — this is what we mean when we say that they are *real* objects. So when theoretical perception is returned to them the image of them reappears in the world of the person concerned, where it is empirically perceived. The image, on the other hand, does not exist between these occasions of perception, hence is not theoretically real. In other words, when we theoretically perceive the real object, an image of it is produced in our brains and it is this image that we empirically perceive; the image is unreal, but reperceptible because its original is real. Empirically, to be is to be perceived, as Bishop Berkeley put it: if you do not perceive it, it does not exist. (Theoretically, on the other hand, to be is to exist independently of being perceived.) So when you put the potatoes on to boil you empirically perceive an image of the real potatoes — that is, empirical raw potatoes; when you go away, the image ceases to exist

(except as a memory, which is an image of the image); the real potatoes continue to exist while you are away, and also to cook; when you return in twenty minutes you empirically perceive a new image, the empirical cooked potatoes. But between the two occasions of perceiving potatoes, the empirical potatoes did not exist.

Third, if causal coherence is the mark of reality then the theoretically real world must be causally coherent; so insofar as our images of reality are true copies of it, they also will be causally coherent. So if theoretically real potatoes are put on to boil for twenty minutes, at the start you will perceive images of raw potatoes and at the finish, when you return to them, you will perceive images of cooked potatoes — because the real potatoes cook during this time, even though no images of them exist during this process: the two empirical events are causally coherent because their originals are causally coherent.

Fourth, the distinction between mental and material is one we make in classifying the contents of consciousness. It is a fuzzy distinction, as has already been pointed out, and therefore unreliable in providing a criterion for reality. We will go further into the basis for our making this distinction later, but for now we may say that, quite contrary to common sense, consciousness is a mental phenomenon and so *all* that we are conscious of must be mental — as opposed to the theoretically real, which is mostly not mental. So since the so called material is within our consciousness, it must be mental.

11: More Details

These are the bare bones of the solutions to the problems. Let us now go into more detail.

Your empirical world always has what are called horizons of the moment — limits to your world beyond which you cannot perceive at that moment. The horizons are your farthest images at that time. The farthest horizons of all are the hemisphere, or dome, of the blue sky in the daytime and the equally distant (and hence equally near) dome of black sky and visible stars at night. For an astronaut on a space walk the horizon of the moment is a sphere of black sky and visible stars. Do not confuse these visible stars — empirical stars — with the stars which are light-years away. The latter are theoretical stars and the former are images of them. All these empirical stars are inside your theoretical head. Your empirical world — all that you are conscious of, in perception, around you — is equally images inside your theoretical head. Like God, your theoretical skull and all of the rest of the theoretical world, transcends your empirical world. As such your empirical world is unreal, in the sense of theoretically unreal, because it ceases to exist when you are unconscious, although it is partly real in the sense of empirically real, the sense of being a true copy of the real world beyond the blue sky. Thus your empirical world ceases to exist when you are asleep: it ceases to exist entirely in a dreamless sleep, or is replaced by your dream world when you dream, and your dream world, it may be noted, is also external to your empirical (i.e., dream) head, is also inside your theoretical head, but is neither public nor reperceptible. Also, we think of the normal horizon being about eight kilometres, or five miles, away, so that the dome of the blue sky, which meets the earth at the horizon, is a hemisphere having a radius of 8 km. This suggests that our theoretical head must be at least this large. But it is not — simply because a visible 8 km. is much smaller than a real 8 km. Not only does visible size diminish with distance, but visible distance also diminishes with distance: if you look down a straight road which has poplar trees spaced equally along each side of it, the spacing of the trees seems to diminish with distance just as the width of the road does.

Suppose, next, that Jack and Jill are looking at a full Moon. This means that on the theoretically real Earth a theoretical Jack and a

theoretical Jill are both theoretically perceiving the theoretical Moon. Jack's theoretical perception produces images in his theoretical head, which Jack empirically perceives. Which is to say that Jack, as an ego, is conscious of these images. (We will examine later what an ego may be, and how it may be conscious.) This empirical perception means that Jack is conscious of his own empirical body, of Jill's empirical body and of his empirical Moon, along with the rest of his then empirical world. Jill similarly is conscious of her empirical body, Jack's empirical body, her empirical Moon and the rest of her empirical world. Notice that there are two empirical Jacks and two empirical Jills: Jack's empirical Jack is a "me" and his empirical Jill is a "her," both inside Jack's theoretical head; while Jill's empirical Jill is a "me" and her empirical Jack is a "him," both inside Jill's theoretical head. Beyond Jack's Moon and dome of visible stars is his theoretical skull, and beyond that is Jill's theoretical skull, which contains her Moon and dome of visible stars. Beyond both their real skulls are the theoretically real Earth's atmosphere, then the real Moon, then the rest of the fifteen billion light-year, theoretically real, Universe described by astronomers. In so far as the images that constitute Jack's and Jill's empirical worlds are similar to the real, they are public and non-illusory; hence to this extent they are real in two senses of the word *real*: empirically real (or potentially universally public), and true (or similar to this originals). But because they are images, their existence is dependent upon perception and so they are unreal in the sense of theoretically real: they do not exist independently of being perceived. And insofar as these images are true, Jack's and Jill's empirical worlds are similar and so public by similarity — although clearly private by plurality. On the other hand, in so far as the images are false they are illusory, and in so far as the two empirical worlds are dissimilar they are private by dissimilarity, as well as private by plurality. Also, note that the theoretically real moon is public by identity to the theoretical perception of both real Jack and real Jill, while their empirical moons are public by similarity; and the theoretically real moon, although theoretically perceived, is never empirically perceived — nothing beyond the horizons of the moment is ever empirically perceived. Thus there is only one real moon, public by identity to all who theoretically perceive it, and as may empirical moons as there are theoretical

perceivers, public by similarity to all of them. The error of common sense is to identify all these moons, which is impossible because they differ qualitatively, and hence quantitatively.

Jack and Jill can communicate, if we allow that their egos can will their real muscles to move. (We will see later how this might be done.) Suppose that Jack wants to say "Hello" to Jill. He, as an ego, wills his theoretical body to produce certain acoustical vibrations which, sensed by the theoretical ears of everyone in the theoretically real vicinity, produce sound in the empirical world of each such person. So Jill, in her empirical world, hears Jack say "Hello"; she also see his empirical lips move, correlatively. Jack also hears his own "Hello," and senses his larynx, tongue and lips moving — so the "Hello," as a sound, is public by similarity. Jill, feeling friendly, may respond with a "Hello" of her own, by a similar process, and so there may be a meeting of the minds of Jack and Jill. Combined with the moonlight, this could well mean a meeting of their bodies as well: a meeting of their theoretical bodies and hence a meeting of their empirical bodies, in each of their empirical worlds.

You can put yourself in this kind of picture quite easily. At the centre of your empirical world, which centre you always describe as "here, now" is you: the empirical you, an image of the theoretically real you. Around you is your empirical world, bounded by your horizons of the moment: walls, floor and ceiling; or trees around and overhead, with loam underfoot; or blue sky, white clouds, prairie underfoot; or smog, skyscrapers and traffic; or what have you. Beyond your horizons of the moment is your theoretical skull and the rest of your theoretical body, which is the original of your image, or empirical, body. Beyond your theoretical body is the rest of the theoretically real world that is imaged as your empirical world, and beyond this is more real world — real Earth — that is not imaged into your empirical world but which would be if your theoretical body moved into it. Beyond the theoretical Earth is the rest of the Universe: billions of light-years of space-time, and uncountable stars, galaxies, and clusters of galaxies.

Among the empirical objects you perceive are other people, who are special in that they are images of theoretical people. The theoretical people have minds, they are conscious, they each have an empirical world and an empirical "me, here, now" within their theoretical heads.

This means that the empirical people that you perceive around you do not have minds, and are not conscious as you are. They behave as if they are conscious because they are reasonably true images of theoretical people who do have minds; but these images are no more conscious than film stars imaged on the silver screen, or television pictures of people, are conscious. Thus in Jack's empirical world his own empirical body is conscious and has internal sensations but Jill's is not and does not, while in Jill's empirical world her own empirical body is conscious and has internal sensations but Jack's is not and does not. Another belief shock, difficult to handle when looking at someone you love.

So there are three corrections that we have made to common sense. First, empirical objects are not theoretically real, although they are relatively empirically real: they do not continue to exist when unperceived, although they are relatively true images of theoretical objects. Second, empirical objects are not public by identity, they are public by similarity. Third, empirical other people do not have minds. All three errors are errors of naive identification. In each case there is an original and an image of it, and common sense supposes the two to be one and the same, identical, and then attributes the properties of the original to the image. This supposition and attribution are both beliefs, perception substitutes, which cannot be true. It is true that theoretical objects are real in the sense of existing independently of being theoretically perceived, they are public by identity to the theoretical perception of many people, and theoretical people do have minds. But their images do not have these properties: they exist only while being perceived, they are as plural as their perceivers, and empirical other people are mindless. The principle that qualitative difference entails quantitative difference proves that the original and the image of it cannot be one, as common sense requires. Common sense in this respect is as naive as is the belief that sticking pins in the voodoo doll will hurt the person that it represents.

This is the early road to profundity. Once these three naive mis-identifications are understood and corrected, exploration of the philosophically profound has started. This is not to say that you must go about your daily life trying to fit all these philosophical conclusions into what you do. These errors of common sense are all errors of over

simplification: false, but useful in an overly complex world. But when you are being philosophical the errors must be corrected. This situation is analogous to the astronomical situation of our Earth, which is spinning on its axis and travelling around the Sun at about 30,000 k/h (18,000 miles per hour): in our daily living we completely forget about such movements, because they are an unnecessary complication to our ordinary lives.

12: Four Notes

We are not out of the woods yet, philosophically speaking. There are, in particular, two immediately resulting problems that we must note, for now, and which we will examine later. One is the problem that everything which is always beyond everyone's horizons of the moment cannot be empirically perceived, by anyone, ever; so how can we know anything whatever about it? In other words, how can we ever know anything whatever about the theoretically real world? The other is the problem that if everything empirical is an image in someone's consciousness then it must be *ideal*, in the philosophers' sense of this word: it must be composed of *ideas*, it is of the mind; which immediately raises the ancient question: what is mind?

But first, a short digression: does the tree that falls in the forest, with no one around to hear it, make a sound, or not? Bishop Berkeley's problem is solved as soon as it is understood that the word *sound* has two meanings. In physics, it means a vibration, in the frequency range of, roughly, 20-20,000 Hertz, or cycles per second; such a vibration produces theoretical sound waves in the theoretical air, which travel at a speed of about 300 metres per second. When such waves land on the theoretical ear-drums of anyone who is not deaf, the ears produce an empirical sensation of sound. The vibration is the cause of the sensation and the sensation is the effect of the vibration. The cause and the effect differ qualitatively, so must be two: to suppose them one — to identify them — is naive. When a real tree falls in the real forest, it produces the vibration; but if there is no real person around to hear it, the vibration does not produce an empirical sensation — and, also, there exists neither an empirical fallen tree nor even an empirical forest. So the solution to the problem is either yes or no, depending on which meaning of the word sound you use: yes there is a vibration sound, no there is no sensation sound.

A parallel problem is the old question of whether colour exists in the dark. The answer is yes or no, depending on what you mean by colour. If you mean the molecular properties that reflect certain wavelengths of electromagnetic radiation, then colour does exist in the dark; but if you mean the electromagnetic radiation itself, or else the sensations of colour that it produces in someone's consciousness, then colour does not exist in the dark.

12: FOUR NOTES

We end this chapter with a remark on attention span. Some fortunate people have a very long musical attention span, so that they can listen to a piece of chamber music and follow without difficulty one or more themes, variations on the themes, and a fugue on these variations: as they listen, all the earlier music is available to them. Those who lack such a musical attention span can compensate by studying the musical score, and so get to know that musical piece as a whole. In a similar way, some people are fortunate in having a long logical attention span: they can follow a long, sequential, argument without difficulty, remembering earlier valid conclusions as present premises. But most people cannot do this. Instead they have to study arguments one by one, and obtain the whole sequence of them by remembering that they did earlier verify the validity of the present premises, even if they do not remember the details of the verification. Most people will have to do that kind of remembering with the next chapter, since the argument in it is long and detailed. This requires a fair amount of work. However, as weight-lifters say: no pain, no gain[5]. If you want the profound you have to work for it at least a little bit.

[5]Or, as some weight lifters say, much pain, little gain.

13: Solipsism

In this chapter we are going to look at one of the problems given in the last chapter: how can we know anything about reality if reality cannot be empirically perceived by anyone, ever? Wisdom, after all, would be impossible without knowledge of reality.

One possible approach to this problem is the kind of argument called *reductio ad absurdum*, or reduction to absurdity, also sometimes called argument by contradiction. This is to assume the opposite of what you want to prove, and then show that this assumption leads to a contradiction. Since a contradiction cannot be true, the assumption must be false, in which case what you want to prove must be true. So we might assume that we cannot know anything about reality, and see what happens; or we might go further and assume that there is no reality at all, so that no knowledge of it is even possible in principle. If this leads to absurdity — to one or more contradictions — then there must exist at least some reality.

The necessary assumption can be made most easily with the definition of an *imperceptible*. If we define a *perceptible*, for person X at time T, as anything that person is conscious of at that time, then an imperceptible, for X at time T, is anything that X is not conscious of at time T. We then make the person X be whoever is considering this argument, and the time T the time they are considering it. Which means that X is you and T is whenever you are reading this. For clarity, this can be done by representing X and T by *I* or *me,* and by *now*. The assumption then is: no imperceptibles, for me, now, exist. This requires that no theoretical reality, and no other minds, exist.

If I can now produce a self-contradictory conclusion from this assumption then I shall have proved that some imperceptibles, for me, now, *must* exist.

The first conclusion that can be drawn from this assumption is that all that exists is what I am conscious of, now. If no imperceptibles, for me now, exist then only perceptibles, for me now, exist — and this is all that I am conscious of now. I can define myself — *I*, or *me* — as the totality of my consciousness: indeed, this is the only satisfactory definition possible in these circumstances. So it follows that the assumption that no imperceptibles exist implies that I alone exist. This is the philosophical position known as solipsism.

13: SOLIPSISM

Within my present consciousness are memories of the past and expectations for the future. These are images: memories are images of the past and expectations are images of the future. They have to be images, since only images can be false. To remember is not to perceive the past, since the memory could be false; and similarly with expectations and the future. So the past and the future — the originals of these images which are memories and expectations — are imperceptible: they cannot be perceived now. Hence they do not exist, according to the assumption that no imperceptibles exist. Consequently all the memories and expectations that I am conscious of now — which are the only ones that exist, since all others are imperceptible and so do not exist — are false. And if the past and future do not exist then time does not exist. Only the now exists, an eternal present. But I clearly experience a sensation of travelling through time. Is this a contradiction, which proves by *reductio* that past and future exist? Unfortunately, no. If time does not exist then the sensation of passage of time must be an illusion: it must be because it could be, and this *could* does not contradict our assumption.

I also perceive changes around me, and we earlier saw that change is dissimilarity over time (see page 7). So if time does not exist then change must be impossible. But this also is not a contradiction, since my perceptions of change are, also, necessarily, illusions.

In fact, everything I perceive must be an illusion, in the sense that it is unreal. The real is all that exists independently of consciousness, and if only perceptibles, for me, now, exist then all that exists does so only in my consciousness, and so is unreal; so nothing is real and hence all is unreal, or illusion.

If all that I perceive is illusion, what about my mind? What about my beliefs? As shown earlier, beliefs are a perception substitute: they refer to what I do not in fact perceive now. What makes a belief true is the existence of what it is about, and all such existence is imperceptible: all beliefs are about imperceptibles. Since no imperceptibles exist, by my original assumption, all my beliefs must be false. All my beliefs are all the beliefs that I am conscious of now, since any others are imperceptible and so do not exist.

Why then do I exist, alone? And why do I have all these illusions and false beliefs? To ask why is to ask for an explanation, for a cause.

But causes are earlier than their effects, so that the causes of present effects must be past, and so imperceptible, and so non-existent. Which is to say that all explanations — all that I am conscious of now, since no others exist — have to be false. Whatever explanation I may have for the very peculiar doctrine of solipsism must be false. I am stuck, unchanging, in an eternal moment for no reason whatever, and all that I perceive is illusion and all that I remember, expect, and believe is false.

We are looking for contradictions in all of this, but illusions are not necessarily contradictions: although all contradictions are false, not all that is false is contradictory; and although all contradictions in perception are illusions, not all illusions are contradictory. So the assumption that no imperceptibles exist does not prove a contradiction: it proves that all is false, but this does not contradict the assumption. Solipsism, it turns out, is a perfectly consistent philosophical position: it contains no contradictions and thereby could be true. The mere fact that solipsism is peculiar beyond acceptance does not make it false. If it did, then the very peculiar subject of quantum mechanics would be false also, and since it is the most comprehensive and successful part of all of physics, this is hardly likely.

Notice that solipsism is no problem for people of common sense, since common sense includes naive realism, which automatically makes solipsism false by assuming the reality of what we perceive. But I (which is what you refer to yourself as) have already gone beyond naive realism, and so must contend with the possibility that solipsism is true. I do not want it to be true, but such mere desire is no ground for philosophical belief — it is only ground for sophistry.

I have been saying “I” here, rather than “we,” since I am stuck in solipsism. Any philosopher who progresses beyond naive realism is stuck with the problem of solipsism. We do progress beyond naive realism because naive realism is inconsistent, it contains contradictions. The Leibniz-Russell theory is consistent, and solipsism is consistent, but how do we choose between them? Solipsism is also a problem because not only does it make all of common sense false, but it also precludes any possibility of wisdom, of profound truth: because wisdom is imperceptible to me now, it cannot exist. So if solipsism is true then I am out of the frying pan of common sense and into the far worse fire of solipsism.

13: SOLIPSISM

There are in fact two ways of dealing with solipsism. Neither is fully satisfactory, but each has an advantage over the other, so that together they reinforce each other. One of them is to try to prove that at least one imperceptible exists. Since we normally prove existence empirically, by perceiving, this is very difficult but not necessarily impossible: we cannot perceive the imperceptible, but perhaps there is another way to prove existence. We will consider an argument of this kind later. The other arises from asking why it is that we dislike solipsism so much. Is this dislike merely irrational, or is it based on good philosophical intuition? A possible answer to this question is the psychological fact that, among explanatory beliefs the strength of a belief is proportional to its power to explain. An explanation is more powerful in so far as it can explain a greater and greater quantity of facts, in greater and greater detail. Recall that explanations are causal: to describe causes is to explain their effects; and the causes are theoretical, they exist in the theoretically real world, not in empirical worlds. Since such causes are imperceptible, explanations are a matter of belief. The significance of this is that the power of solipsism to explain is zero: if solipsism is true then all explanations are false. Hence the strength of our belief in solipsism is also zero. I might add that I am here considering rational belief, not irrational; a creationist may well believe strongly in Genesis and not at all in evolution, but that is in spite of evolution being a better explanation of the origin of humanity than is Genesis — as will become clear shortly, if it is not already — because the creationist has irrational reasons for so believing. The difference between the irrational and the rational also will be explained later.

That we cannot rationally believe solipsism does not disprove it, of course, but it does give grounds for rejecting it. So we need next to ask which are the best explanations. The answer is definite, although many people will not like it: the best explanations are scientific. It is true that science excludes from its domain the beautiful and the good, which is why many people dislike it. Also, it is largely mathematical, which is another cause for dislike by many. And, thirdly, it leads to all kinds of technology that many people dislike and fear, such as nuclear energy, toxic chemicals, and genetic manipulation. But none of these alter the fact that science produces better explanations than any other

human activity: better than common sense, better than myth, better than theology, better than metaphysics. So we will look at what makes an explanation a good explanation, and why science gives us the best of them. In order to do this we must examine the nature of science in more detail.

14: Science

In principle, according to the Leibniz-Russell theory, in order to know reality we have to discover what is true in empirical worlds, since this is similar to reality. To do this we have, in a sense, to decipher the empirical world: we have to sort out what, among everything empirical, is illusion and what is non-illusion.

There are several ways of approaching this. One method of deciphering mere appearance is common sense, which is a mixture of the irrational and the practical: what works is true, and otherwise the irrational is assumed true: irrationalities conducive to vanity and, through simplicity, to ease of thought — such as humankind being specially created, on a world fixed at the centre of the Universe, with all else created for our benefit, and, secretly, me being the most important person among all of humankind; and simplicity, such as naive identifications of voodoo doll and person, of name and named, and of reality and images of reality. A second method of deciphering empirical worlds is science, in which the ultimate touchstone of truth is empirical data — potentially universally public data. A third method is philosophy, whose ultimate touchstone is reason. A fourth method is mysticism — an approach very much disliked by many scientists and very much misunderstood by many people (it is often confused with the occult, for example, or believed to be mystification for its own sake) but which is intimately tied up with wisdom and the profound. All of these are of course related. Common sense slowly changes with scientific discoveries, all branches of science were originally philosophy, philosophy cannot ignore science and ultimate philosophy is mystical — as we shall discover.

So in this chapter we are going to look at the scientific approach to deciphering the empirical. In this process we shall discover another common sense belief which is false and whose correction is a nasty belief shock for people of common sense.

I should begin by explaining that the two main branches of philosophy are *metaphysics* and *epistemology*. Metaphysics is the study of reality, and epistemology is the study of knowledge and of knowing. So we are involved in both, since we want to know both what reality is, and how we can know about it when it cannot be perceived. In particular, we are concerned with how science can help in this. Science

gives us more reliable knowledge than any other human activity; to explain why this is so is to do philosophy of science. Philosophy of science is a branch — probably the most important branch — of epistemology. To examine philosophy of science may seem like a digression from our project of understanding the nature of wisdom, but it is in fact not a digression at all, since wisdom is based on truth and knowledge is true — unlike belief, which is only believed true while often false.

Let us first look at the nature of science and some of the epistemological questions that it raises.

For our purposes, science can be conveniently described as consisting of six stages: (i) data collection, (ii) formulation, (iii) generalisation, (iv) explanation, (v) prediction of novelty, and (vi) design of experiments[6].

Data collection is the acquisition of empirical data. In a young science it is simply collection of all and any facts which might be relevant. The data may be collected in an observatory by an astronomer; in the field by a geologist, zoologist, botanist, or other field scientist; or in a laboratory by an experimentalist such as a physicist, chemist, or biologist. In an established science data collection is obtaining results from the experiments designed in stage six. Empirical data are the foundation of all science: without this foundation there would be no science. Because of this scientists used to believe, falsely, (and many still do) that science is exclusively empirical. So we can ask: *why are empirical data so important?*

Formulation — stage two — is arranging the data of stage one into a more ordered state. The data starts out ordered to some extent, of course: it is usually in chronological order, in notebooks. A very simple, but hardly scientific, ordering is alphabetical, as in an encyclopaedia. There are two kinds of ordering which scientists use: classification, and mathematical ordering. Classification is the ordering used with qualitative data, and mathematical ordering is used with quantitative data. For example, biology used to be entirely a matter of

[6]I once heard a scientist lecture on the nature of science. He said that it consisted of five stages: (i) find a research project, (ii) apply for research funds, (iii) do the research, (iv) write up the results, and (v) publish the results. My six stages are all in his third stage, so perhaps we should say that there ten stages in all!

classification, into kingdom, phylum, family, genus, species, etc. Mathematical ordering takes numerical data — countings and measurements — and finds a mathematical formula that fits them. We saw in an earlier chapter that quantitative data is preferred to qualitative data because it is more public and therefore more probably true. This is a special case of the deciphering of the empirical, of appearance: in deciphering we are searching for the empirically real, which is the true images among all images, and the empirically true is all that is potentially universally public. So we can ask both: *why are quantitative data more public than qualitative data?* And, also, *why is the public more likely to be true?*

Generalisation — stage three — is conversion of a formula into an empirical law. If a formula is found to hold in all comparable situations, scientists will after a while suppose that it is true in every such situation, including all future ones. If they are right then they have a means of predicting the future, to the extent of saying that if there is a comparable situation in the future then the formula will apply. This kind of prediction is prediction of repetition: it is prediction that the future will, in this respect, be like the past — it will repeat the past. Two examples from the early days of science are Boyle's Law and Charles' Law. Boyle's Law says that if the temperature of a gas is held constant then changes in pressure vary inversely with changes in volume: increase the pressure and you reduce the volume, and *vice versa*. Charles' Law says that if the pressure is held constant then changes in temperature vary proportionally with changes in volume: increase the temperature and you increase the volume. These days the two laws are combined into what is called the Ideal Gas Law, expressed by the formula $PV=aRT$, where V stands for volume, P for pressure, T for temperature, and a and R are constants of proportionality.

Generalisation is a peculiar kind of inference to use in science, because it is invalid: in it, true premises do not guarantee a true conclusion. In logic an argument is said to be valid if the truth of the premises necessitates the truth of the conclusion, as in "If Pat is a wife then Pat is a woman. Pat is wife. Therefore Pat is a woman." Generalisation is invalid because it is argument from *some* to *all*, in which the *all* may be true but is not necessarily true. For example, from "The formula is true in some cases" — those actually observed — to

"The formula is true in all cases." This kind of argument is called inductive; we all of us use it frequently, usually very badly. Superstition is inductive, as in "Several people have had bad luck after breaking a mirror, therefore it is always unlucky to break a mirror." Stereotypical thinking is also inductive, as in "Every Scotsman that I have ever met was wearing a kilt therefore all Scotsmen wear kilts, all the time." Superstition and stereotypical thinking are the basis of much prejudice, and prejudice is fatal to good science, so naturally it is most important that scientists avoid superstition and stereotypical thinking, yet remain able to use induction in order to generalise their formulas. As we saw earlier, the difference between good and bad generalisation is that good generalisation is objective and bad generalisation is subjective; objectivity is attention to the public while subjectivity is attention to the private; and the public, provided that it is potentially universal, is more likely to be true. So we can ask again: *why is the public more likely to be true?*

There is a second point about induction. For empiricist philosophers, who believe that *all* of our knowledge comes through the senses, the problem of induction is the most important problem in philosophy of science, and the most intractable. This is because, if one is a strict empiricist then all knowledge, without exception, comes through the senses; which means that we cannot have any knowledge of generalisations — since generalisations cannot be perceived. So for a strict empiricist there can be no knowledge of empirical laws. The problem of induction then becomes the problem of how one can remain an empiricist and yet justify empirical laws. The answer is simple once one understands the proper nature of empirical laws. Recall that what can be perceived is empirical and what cannot be perceived is theoretical. Scientific generalisations cannot be perceived and so they are not empirical, they are theoretical. "Empirical law" is a misnomer, a sophistry invented to maintain the belief that science is exclusively empirical. The proper term should be "theoretical law," simply because such laws cannot be perceived and so are theoretical; but since the usage is unlikely to change I shall speak of *scientific law*, in order to avoid the naive term *empirical law*. The problem of induction is then seen to be part of a much wider problem: the problem of *how can we have any theoretical knowledge at all?* This is the problem with which

we started this chapter, and which earlier led us into solipsism. It has to be solved sooner or later if there is to be any possibility of wisdom.

Explanation in science — stage four — is invention of a theory which explains scientific laws. A theory is a logical system of ideas within which scientific laws can be deduced. For example, by assuming that gases are composed of a very large number of tiny molecules, which possess mass and obey Newton's Laws of Motion, it is possible to define the temperature of a gas as the average kinetic energy of the molecules, and the pressure as the average force of reaction as they bounce on each other and on the container of the gas, the volume of which is the volume of the gas; and it is then possible to deduce the Ideal Gas Law. (The law is called ideal because it is only approximately true: if the gas is nearly cool enough to condense into a liquid it is a vapour rather than a gas, and the closer it is to condensation the less it obeys the Ideal Gas Law.)

According to scientists, when such deduction of scientific laws in a theory happens, the laws are explained by the theory. This is a different kind of explanation from that of philosophers: philosophically, explanation is causal — to describe causes is to explain their effects. So we can ask: *what is the relationship between deductive explanation in science and causal explanation in philosophy?*

A second, more general, question is: where do theories come from? They have non-empirical content, which is to say that they refer to things which are not perceived by anyone, ever; if we do not perceive these things, how can we know anything about them? So we can ask: *how do scientists make theories?*

Prediction of novelty — stage five — is theoretical prediction of empirical novelty. That is, the novelty is predicted by being deduced within the theory, and it is a novelty in the sense of never having been empirically perceived. Two of the more spectacular examples of this from the history of science were the prediction of radio from Maxwell's equations in electromagnetic theory, and the prediction of nuclear energy from Einstein's famous equation $e=mc^2$. Radio and nuclear energy were unknown until they were predicted by their respective theories. Not only this, but theoretical prediction of empirical novelty is an almost everyday event these days. A theoretical scientist will deduce a novelty from his theory and then various experimental scientists will

test the prediction to see if the novelty appears. If it does the theory is regarded as almost certainly true, and if it does not then the theory is falsified. Another curious point about prediction of novelty is that generally only mathematical theories can do it. The theory of evolution, for example, although an excellent theory because it explains so much, is not mathematical and does not predict novelty. To be sure, the theory of evolution predicts that novel species will arise, but this is only prediction of repetition, based on the fact that many novel species have arisen in the past; it would be prediction of novelty if it said what entirely new biological feature the new species would possess[7]. So we can ask two questions: *how is theoretical science able to predict empirical novelty, successfully and often;* and *why do only mathematical theories do this?* The first question is part of a larger question: *what is the method of science?* Many people believe that if the method of science can be spelled out in detail then it can lead to comparable success in other fields, such as ethics or economics; for these people, this question is the most important in all of philosophy of science.

Design of experiments, the sixth stage of science, is done to test predictions of novelty. The best designs are usually extraordinarily simple, and this simplicity hides the genius of the scientists who design them. They are like Columbus' egg, and other puzzles which are almost impossible to solve until you know the solution, after which they are remarkably easy. As an example of this, suppose that you are Heinrich Hertz, you have studied Maxwell's equations, and you want to test the prediction that there should be electromagnetic radiation of wavelengths other than those of visible light and radiant heat — radio, in other words. How would you go about it? If you do not know the history of radio, and you recognise that you would not be able to use transistors or radio vacuum tubes, or even galena crystal as a rectifier, because they have not been invented or discovered, what would you

[7] There are two exceptions that I know of to the mathematical nature of prediction of novelty. One was Harvey's prediction of the existence of capillaries (before the invention of the microscope that revealed them) so as to explain the circulation of the blood. The other exception was Mendeliev's prediction of new chemical elements with his periodic table. Both of these predictions were prediction by interpolation, in much the same way that we can predict the shape of a missing piece of a jigsaw puzzle by the shape of the surrounding pieces.

do? For that matter, suppose that you are Marconi and you know of Hertz' discovery and want to make radio a practical technology —how would you go about it? If you were to read the history of all this you would find that their solutions were simple and elegant —but unless you are yourself a genius or already know this history, you cannot figure out how they did it. Two of the cleverest experiment designers in the last two centuries were Michael Faraday and Ernest Rutherford; but if you look at the history of their work their experiments seem so simple and obvious that it is not surprising that they are often underrated. So, bearing this in mind, we can ask: *how do scientists design experiments?* This question is also part of the problem of discovering the method of science.

The sixth stage of science brings us round to the first again, since an experiment, once designed and conducted, produces new empirical data. In this way scientists can cycle through the six stages again and again, improving their scientific laws and theories each time round. This is sometimes called the process of successive approximation to the truth. The fact that it occurs raises the point that scientists do not claim truth for their laws and theories, they only claim probability. When they increase the probability of their laws or theories they get closer to the truth, but they never claim to have reached it. They are never certain. Perhaps the most probable principle in all of science is the principle of conservation of energy, and not even this is certain. However, if we are curious as to what this probability of laws and theories is, we find that the word probability has three distinct meanings. We do not need to go into them in great detail, but we can characterise each by how we get to know about it. One kind is mathematical, or theoretical, or Laplacian probability, which is calculated; another kind is relative frequency, or empirical, or statistical probability, which is measured; and the third kind is subjective probability, or strength of belief, which is evaluated. So we can ask: *which kinds of probability do laws and theories have?*

Another fact about science needs to be mentioned: the criteria of good science that scientists use. We saw in Chapter 3 that there are three criteria for empirical science: (i) scientists must be objective; (ii) quantitative data are better than qualitative data; and (iii) experiments must be repeatable. And we saw that each of these is justified by the

claim that what is potentially universally public is most likely to be empirically real — true. We have already asked, above, why the public is more likely to be true, so we can leave these criteria of empirical science for now and turn to those of theoretical science.

There are at least nine criteria of good theoretical science. There are first of all two falsifying criteria, which usually overrule all the others if they apply: (i) a theory must not contain any contradictions and (ii) it must not imply conclusions which are false; this latter is sometimes put in the form: a theory must not be contrary to empirical fact. The other criteria are verifying criteria: they make a theory more probable. They are: (iii) the larger the scope of a theory and (iv) the greater the density of detail within a given scope, the more probable the theory is: breadth and depth increase probability, one might say, or the more empirical fact a theory explains, the better it is. These two criteria are very important, for the obvious reason that the task of theory is to explain, so the more empirical fact it explains the better it is. The next most important verifying criterion is (v) prediction of novelty; if a theory predicts significant empirical novelty successfully it will never be abandoned, although it may be modified in ways which do not affect that prediction. Other criteria are less important, but far from negligible. They are: a theory should be (vi) beautiful, (vii) simple, and (viii) integrable with other probable theories —that is, it should be possible to unify two probable theories —and (ix) symmetries within theories are desirable. Many of these criteria are rule of thumb criteria, discovered by trial and error through the past two or three centuries: they have been discovered to be reliable. But we can certainly ask: *why is it just these criteria that apply to theories?*

Finally[8], there is a little known fact about science, which needs to be explained. We know that scientists distinguish between empirical science and theoretical science, but most scientists do not understand why. The reason is this little known fact, which we have already touched upon: there is a fundamental difference between the things

[8]Some readers may be wondering why I have said nothing about statistically significant numbers of trials, and control groups, in this survey of science. The reason is that these belong to the kind of science that might be called *extensional*, as opposed to the science discussed here, which is *intensional*. These terms *extensional* and *intensional* are explained later (page 142).

these two sciences talk about, and this difference is characterised by the very words empirical and theoretical. *Empirical* means known through the senses, or perceptible; and *theoretical* means non-empirical, or not known through the senses, or imperceptible. It is a fact that every entity described by theoretical science is never perceived by anyone, ever. Most people familiar with science will be sceptical about this claim, but it is easily established. Consider mass, for instance: a theoretical entity invented by Newton to explain the facts of mechanics. We cannot perceive mass, although we can perceive the effects of it: forces of weight and forces of inertia. Or consider temperature, which is average kinetic energy of molecules; we can perceive the effects of this, which include sensations of warmth and thermometer readings, and which are thereby empirical, but we cannot perceive the molecules or their kinetic energy, which are theoretical. Or consider voltage: we can perceive the effects of it, such as a voltmeter reading or an electric shock, which are empirical; but we cannot perceive voltage itself, which is theoretical. If we could perceive mass then we would know whether it was quantity of matter, as Newton said, or a form of energy which distorts space-time, as Einstein said; the fact that we do not *know* which it is — we can only *believe* — shows that it is imperceptible. The fact that we can see large molecules "through" an electron microscope does not mean that molecules are perceptible, it only means that an electron microscope can make images of them, and these images are empirical; but their originals remain as theoretical and imperceptible as ever. So we can ask: *why are there two kinds of science, empirical and theoretical, and what are the relationships between them?*

So we have a set of questions about science which any philosophy of science should be able to answer more or less satisfactorily. There have been quite a number of philosophies of science since the rise of modern science, and none of them can answer any of these questions satisfactorily. The reason is that all of them are sophistries. They all have, built in, at least one dogma of common sense, which is rarely stated, let alone questioned: it is the common sense dogma of naive realism: each person's empirical world and the theoretically real world are all one and the same, identical. As long as this dogma is maintained, none of our questions about science can be answered satisfactorily. But as soon as the dogma is corrected, as we

did in Chapter 8, with the Leibniz-Russell theory, they can all be answered, and answered well.

All of these sophistical philosophies of science rely on one of two sophistries: either that theoretical science is really empirical, or else that theoretical science is fictitious. For example, it may be argued that theoretical science is really empirical because (i) theoretical entities are the causes of empirical entities and, (ii) since to perceive an effect directly is to perceive its cause indirectly, it follows that (iii) to perceive empirical entities directly is to perceive theoretical entities indirectly, which (iv) is to perceive theoretical entities, hence (v) theoretical entities are perceived so (vi) they are empirical. But, as se saw earlier (see page 29), so called indirect perception is not a form of perception at all, it is a circumlocution for belief, and this belief is of imperceptibles — which are not empirical. Those who claimed that theoretical science is fiction, on the other hand, always hastened to add that it is not thereby meaningless: after all, Shakespeare's *Hamlet* is fiction but not thereby meaningless. The problem for these sophists was to explain what the meaning of theoretical science is, if theories are fictitious. Three once prevalent answers were that its meaning is *conventional*, that its meaning is to be found in *operational definitions* of theoretical entities, and that its meaning is found in the fact that theories are mental *instruments* for doing science. This last was the most popular, perhaps because instruments connote laboratories and empirical science. However they were all desperate remedies which failed and the few sophists who still believe them are dying off.

The fact of the matter is that there is no great difficulty in answering all these questions about science once common sense realism is abandoned. Let us look at these easy answers, in the light of the Leibniz-Russell theory.

15: Philosophy of Science

Three of our questions about science are psychological in nature and the rest are concerned with the nature of truth. We will deal with the psychological ones first — only briefly, until the nature of mind is further examined — and then look at the truth questions.

Two of the psychological questions are: how do scientists make theories, and how do they design experiments? Together these constitute the problem of discovering the method of science. The answer in each case must, for now be limited: each is done by means of *creativity*. The limitation is that we do not yet know what creativity is, although we will find out later. At present the interesting point is that creativity in science is the same as creativity in mathematics, music, poetry, painting, sculpture, architecture, cooking, gardening, etc. It is an ability that some people have, and it is innate: it is born, not made; and people who have it in abundance we call geniuses. Geniuses can produce things which are both new and valuable, and which ordinary people cannot. New and novel theories, experiments, musical works, poems, pictures, statues, buildings, culinary dishes, etc. The significance of this, philosophically, is that it is a point in common that all these activities possess; that they have such a point in common strongly suggests the possibility of their unification. We may note the scientific significance of this, also: the fact that great science requires genius means that there is no general method of science. Many philosophers in the past have sought the method of science in order to generalise it to other, non-scientific, fields. The best known, due to John Stuart Mill, are called Mill's Methods, a catalogue of ways of finding correlations, ways all known to medieval philosophers and none of which are used by scientists to any significant extent. The problem of finding the method of science is not a problem in philosophy of science, because there is no such method: there is no method of genius.

Connected with this last point is a social one. Ever since the second world war, during which politicians discovered that scientists can produce technological marvels of great value to those who crave power, the industrial nations have been subsidising scientific research on a grand scale. The reason that this does not work well can be explained by an analogy. Suppose that society for some reason needed landscape painters in great quantity: since people with such a skill are

rare, society would have to hire people who were only mediocre painters, people able to paint by numbers, in the manner of those painting kits in which the canvas is divided into numbered areas, each of which is to be coloured by the pseudo-artist according to the number. So these days we have a great number of researchers doing science by metaphorical numbers. A genuine scientist is someone with an insatiable curiosity, plus the intelligence and creative genius to satisfy that curiosity. A pseudo-scientist is someone who lacks these essential attributes, but has obtained the university qualifications of a scientist. Such a non-genuine scientist is most easily recognised by his or her difficulty in finding research projects. By way of further digression, a similar social problem may be seen in connection with teaching, from the primary to the post-secondary levels: there are not enough innately gifted teachers to go round, and the balance of them teach by metaphorical numbers — which in this case usually means teaching lists and algorithms by rote, as opposed to communicating understanding.

The third psychological question seems at first to be a question about truth. It is the question: what is the probability of theories and laws? The more probable they are, it would seem, the more true they are. But this is not so. Secondly, we distinguished three kinds of probability, measured, calculated, and evaluated; so it would seem that since empirical science deals with measurement, the probability of supposedly empirical laws should be measured probability, or relative frequency; and since theories are, usually, mathematical, their probability should be calculated, or mathematical, probability. But this also is not so. We must distinguish between the probability *stated* by a law or theory, and the probability *possessed* by them. A law may state a measured probability, but it does not possess one; and a theory may state a calculated probability, but it does not possess one. For example, a rough and ready law is that the probability of you being struck by lightning is very low; but this low probability does not mean that this law is probably false. And an example of a theoretical probability is the calculated probability that drawing four aces in a poker hand is approximately one out of a quarter of a million; but this low probability does not mean that the theory is probably false. In fact, the probability possessed by laws and theories is subjective, or evaluated, probability:

it is the strength of belief of scientists in the truth of the laws and theories. More accurately, it is the consensus of scientists' strengths of belief, which is an interesting point since consensus is a matter of publicity. Strength of belief is a psychological thing, and when we examine mind we will look into the nature of belief, and its strength. For now we need only remark that many scientists are very reluctant to accept this conclusion, since subjective probability seems to fly in the face of the criterion that science must be objective. However the conclusion is inescapable. It might provide some relief to observe that consensus of belief is a way of being objective about subjective belief. This point also carries with it a suggestion of unification, because if laws and theoretical science are a matter of belief then perhaps they have something in common with other belief systems, such as religious ones. This also is a matter to be returned to, but for now we might point out that there is an orthodox religion for many scientists, about which they are just as likely to be as dogmatic and closed-minded as any religious fundamentalist: it is atheism. I say this because it is characteristic of both atheists and fundamentalists to interpret religious metaphors literally: the atheists do this in order to ridicule, and the fundamentalists in order to banish all doubt.

All our other questions about science concern truth, which, as we have seen, is a relation of similarity between reality and an image of reality. It is now necessary to say what feature of images it is that is true or false. It is their *structure*. The structure of a thing is all the relations between all of its parts. So everything that has parts has structure.

The reason for claiming that it is the structure of images which is either true or false is the fact of mathematics in science. Mathematics is the language of relations and structure is made up of relations, so mathematics describes structures. There are also relations between structures, and mathematics describes these also. At least, mathematics describes many of them; mathematics is incomplete, and many relations that we know of are still too complex to be part of the subject matter of mathematics: the relations of biology, for example — which is why the theory of evolution is not mathematical. We will examine relations in greater detail in the next chapter; for now it is enough to have some idea of the nature of structure.

BELIEF SHOCK

We can say that empirical objects or things are structures: they are structures of concrete qualities such as colours, hardness and softness, solidity, weight, etc.: secondary qualities, in short. And each person's empirical world is a structure of empirical things. Empirical science also is a structure; or, more accurately, it is a set of structures, one per scientist. These are structures of ideas concerning empirical reality. And theoretical science is also a set of structures, one per scientist: structures of ideas concerning theoretical reality. Hence in so far as empirical worlds, empirical science, and theoretical science, as distinct structures, are similar to the structure of theoretical reality, so are they true.

Just by saying this we have answered one of the questions about science: why are there two kinds of science? There are two kinds of science because there are two kinds of reality: empirical reality, which is all true features of empirical worlds, which probably is everything empirical that is potentially universally public; and theoretical reality, which is all that exists independently of mind, and some of which is imaged into empirical worlds. Needless to say, empirical science tries to describe empirical reality and theoretical science tries to describe theoretical reality.

Intimately tied up with this is the question: why is the public more likely to be true? Empirical reality is true features of empirical worlds, and we believe that these are the most public features of empirical worlds — the potentially universally public. Why? The answer is that truth entails publicity. More precisely, truth is a sufficient condition for publicity but not a necessary condition; and publicity is a necessary condition for truth but not a sufficient condition. That is, what is true has to be public but what is public does not necessarily have to be true. (Naturally, we exclude the incapacitated from this publicity: sights are not public to the blind, nor sounds to the deaf, nor reason to the foolish.) So if two side by side real people were theoretically perceiving perfectly truly (which is of course impossible, but suppose it anyway) then their two empirical worlds would be exactly similar, hence completely public. We experience some of this in practice because we have an unconscious process of correcting our empirical perception: we correct for illusions, as, for example, we judge size by taking into account the distance of the seen object; and we add

beliefs to what we perceive based on past experience, as in our regular belief that the opaque object we see has a far side hidden from us. This correction makes our worlds more public, as we find out when we compare notes with other people about what we perceive; and they are more public because they are more true.

However, although the truth necessitates publicity, publicity does not necessitate truth. Publicity only makes truth more or less probable: that is, publicity gives us grounds for believing rationally.

There are other grounds for believing: namely, the criteria of good theories. Just suppose, for the sake of argument, that the structure of reality is a unity which is simple, beautiful, and symmetrical. Then true theories would have to be similar to this, because truth is similarity to reality, and hence theories, if true, would have to be integrateable into one theory and be simple, beautiful, and symmetrical. In which case these four properties would be necessary conditions, but not sufficient conditions, for the truth of the theories. As it turns out in fact, theories which have these properties are, usually, more successful as explanations than theories without them. They are more successful in the sense of greater scope and density of detail, and in successful prediction of novelty. This is grounds for believing them to be true, which in turn is grounds for believing that the structure of reality is a simple, beautiful, and symmetrical unity. Not only does this justify these criteria, but it is another example of the developing unity along the road to wisdom, which was promised early on.

Closely related to all this is the answer to the question: why are quantitative data more public than qualitative data? The answer is that quantitative data are more public because they are more true, and they are more true because reality consists of quantities not of qualities — that is, reality is mathematical, while concrete qualities are secondary qualities, representations, and so illusory.

Notice that we have been answering these questions by supposing features of reality and then saying that our perceptions and ideas of reality will have these same features if they are true — if they are similar in structure to reality. In this way a particularly important feature of reality is added to our beliefs. This feature appears in answering the question of how it is that theoretical science is able to predict empirical novelty, successfully and often. It is the relation of

necessity, which occurs within the structure of a theory in the form of logical, or mathematical, necessity: a relation between ideas such that the truth of one lot necessitates the truth of another lot. This happens in the form of deduction. A theoretical scientist deduces an empirical novelty within his theory, so that if the theory is true then the novelty is true also. This truth is the similarity of the theory to the real world. So if the theory is true then there must be relations of necessity in the real world which are similar to the relations of logical necessity in the theory. These relations of necessity in the real world are causal relations. It is the causal relations which make the prediction of novelty come true. In other words, if the real world contains relations of causal necessity then a true theory will contain similar relations of logical necessity; and if these latter lead to a prediction of novelty then the former will make the prediction come true. Thus successful prediction of empirical novelty is a necessary condition for the truth of a theory, but not a sufficient condition for it — always assuming that there are causal necessities in reality.

Let me give a specific example in order to clarify this. Imagine the great German physicist, Heinrich Hertz (1857-94) thinking about Maxwell's equations. Maxwell's equations, which today are usually expressed in the form of four equations in vector calculus, explain all macroscopic electromagnetic phenomena. According to these equations, an alternating current should radiate electromagnetic waves, travelling at the speed of light and at a frequency equal to the frequency of the alternating current. An electric spark is an alternating current, so it should transmit electromagnetic waves. Also according to Maxwell's equations, if you have a loop of wire of the right circumference to match the wavelength of some electromagnetic waves, and this loop has a small gap in it, then these waves should set up an alternating current in the loop and, if the current is strong enough, produce an electric spark across the gap in the loop. All of this is deduction from Maxwell's equations plus a bit of other physical theory. Hertz set up a spark-gap-loop transmitter and a matching spark-gap-loop receiver and found that when the transmitter was sparking at one end of his laboratory the receiver sparked at the other end. This meant that he had produced and detected radio waves — an empirical novelty predicted by the theory incorporated in Maxwell's equations. What Hertz did was

to deduce the empirical novelty — spark producing spark — from the theory; and this deduction was possible only because of the logical necessity which led from the equations to the prediction. Without the necessity there could have been no prediction, except by blind guesswork. Beyond the walls of Hertz' empirical laboratory — his horizons of the moment — were his theoretical skull and, beyond that, his theoretically real laboratory. In his real laboratory were the theoretically real transmitter and receiver, such that a theoretically real spark in his transmitter caused real electromagnetic waves to travel to his real receiver and there produce a theoretically real spark. Much of this was imaged into Hertz's empirical world, where he saw an empirical spark in an empirical transmitter seemingly produce an empirical spark in an empirical receiver. There was no necessity in his empirical world, because it so happens that causal necessity is not imaged into empirical worlds; but there was a definite correlation: switching on the transmitter produced a spark which was always correlated with a spark in the receiver. Correlation is all that is imaged from theoretical causation into empirical worlds. The key point is that (i) the prediction of spark causing spark would not have been made without the logical necessity, unless by pure guesswork; and (ii) the prediction would not have come true without the causal necessity, unless by pure coincidence. So either successful prediction of novelty occurs through a combination of blind guesswork and pure chance, or else it occurs because a theory is true by similarity to the theoretical world — by similarity to reality — including the similarity between the logical necessity in the theory and the causal necessity in the theoretical world.

It will be remembered that a subsidiary question to that of prediction of novelty was: why can only mathematical theories do this successfully? The answer by now should be obvious: it is because the theoretical world has a mathematical structure. That is, the successful theoretical prediction of an empirical novelty is very strong evidence that the theory is true; if only mathematical theories can be true in this way then part of their truth is their mathematical structure — in which case reality has a similar structure.

We can also answer the question of what the relationship is between deductive explanation and causal explanation. Deductive

explanation occurs when an empirical law is deduced within a theory, and causal explanation is description of causes, which is explanation of their effects. Clearly, to deduce a law within a theory is, if the theory is true, to make clear the logical necessity that relates the theory to the law; and this is to describe the corresponding theoretical necessity, which is a causal necessity in reality. Hence deductive explanation and causal explanation are the same thing.

One of our questions remains: why are empirical data so important? They are important because they are the beginning and foundation of empirical science, which is the beginning and foundation of theoretical science, which is our most reliable knowledge of the reality forever beyond our horizons of the moment.

Implicit in all this is another unification of ideas. We saw earlier that metaphysics is the branch of philosophy that deals with the nature of reality. This reality is, of course, the theoretical world described to some extent by theoretical science. What, then is the difference between metaphysics and theoretical science? Many scientists believe that metaphysics concerns itself with questions beyond the scope of science, beyond the possibility of being verified or falsified scientifically. But this is not so. The difference between metaphysics and theory is one of degree: degree of specialisation, to be precise. Theorists concentrate on *density of detail* in their work, while metaphysicians concentrate on *scope* — these being the two ways of assessing explanations in terms of quantity of empirical fact explained. It is sometimes said that a specialist is someone who knows more and more about less and less until he knows everything about nothing. So may we say that a metaphysician is someone who knows less and less about more and more until she knows nothing about everything. In fact, theoretical science cannot succeed without metaphysics, nor metaphysics without theoretical science. For example, the metaphysicians called rationalists claim that reality must be rational, in two senses: it cannot contain contradictions, and it must contain necessities — causal necessities, analogous to logical necessities; and all theoretical scientists take these two points for granted, usually without realising that they are thereby being metaphysical.

This present philosophy of science tells us that science shows us a lot about the theoretical world, which is probably a single structure

which is simple, symmetrical, and beautiful, contains necessities, and is in part described by mathematics. Mathematics is the language of relations and structure consists of relations, so science points to the possibility that reality consists only of relations. If this is so then since relations are abstract it follows that everything concrete is illusory. Colours and sounds; tastes and smells; tactile sensations such as warmth and cold, hardness and softness, solidity and heaviness, physical pleasures and pains — all of these are concrete secondary qualities and illusory. Only the relations between them may be empirically real. The common sense belief that only the concrete is real — that the abstract is unreal — is false. Another belief shock, another sickening swoop on the roller-coaster.

So now we need to enquire more into the nature of relations, the stuff of reality. This is the subject matter of the next chapter.

16: Problems with Relations

We are not here going to discuss mother-in-law problems, or disputations over inheritances, even though family relations are some among all relations; rather we need to know about relations in general. If relations are the stuff of reality then we must know more about them, since to know more of reality is to gain truth. And since wisdom, the goal of our quest, requires profound truth, we *must* enquire into the nature of relations.

Relations are at once perfectly familiar and very strange. That they are familiar will be obvious as soon as we examine a sample catalogue of them; that they are strange will be shown by the fact that they have given philosophers a lot of trouble in the past because of three peculiar features of them.

First the sample catalogue. There are everyday relations such as *inside, alongside, behind, to the left of, touching, on, above, before, older, between, similar to, part of, more, better, following, mine, yours, every, any, hotter, louder, sweeter, brighter, father of, daughter of, brother of, aunt of, citizen of,* and *captain of*. There are relations between relations, as in "This *discord* is *more painful than* that *discord;*" and there are *combinations* of relations, as in a *change* being a *duration* in *parallel* with a *dissimilarity*, and a *process* being a *succession* of *changes*. There are complex assemblages of relations, as the *structure* of a thing is the totality of relations between all its parts. There are relations having enormous numbers of terms, such as *microstates* and *macrostates*, and *order, disorder, pattern, complexity*, and *diversity*. There are special relations: temporal relations such as *earlier, later*, and *simultaneous*; causal relations, such as *causation, correlation*, and *necessity*; linguistic relations, such as relations between word, sense, and reference, and *grammatical relations* between words; logical relations, such as *truth, falsity, validity* and *logical form*; social relations, such as *justice, liberty*, and *equality*, and those relations between worker and boss, judge and accused, club and member, politician and voter, and government and taxpayer; and there are relations between societies, such as treaties, trade imbalances, and a state of war. And, most important and general of all, there are mathematical relations, such as the arithmetical relations *greater than, equal to* and *less than*; the geometrical relations of *length, angle, size,*

shape, parallel, similarity and *congruence*; and many, many others. In fact, all the entities of mathematics are relations, from the simple relations between numbers to the complicated relations that are algebraic structures. Indeed, we could define mathematics as the language of relations — as it is if it be allowed that the language is still incomplete with regard to such relations as those of biology and society.

One of the previously mentioned three peculiarities of relations, which have given philosophers so much trouble, appears when we ask whether relations can be perceived or not. Consider the example of a candle flame. The flame is *above* the candle, and *hotter than, softer than, brighter than,* and *more penetrable than* the candle. Can we perceive these relations *above, hotter, brighter, softer,* and *more penetrable*? We have to say yes, because otherwise how could we possibly know that the flame is indeed hotter, brighter, etc., than the candle? Yet if we ask what these relations look like, we discover that they have no looks at all, and how can we see something that has no looks? Not only do *hotter than* and *brighter than* have no looks — no colour, for example — but they do not have any other perceptible qualities. They are not hard or soft, rough or smooth, or hot or cold to the touch; they do not sound high or low, or loud or quiet; they do not taste sweet or sour, salty or bitter, or crisp or mushy; nor do they smell in any way. The flame is hot, but *hotter than* is not; the candle is solid to the touch, but *more solid than* is intangible; and the flame is bright and yellow to the eye, but *brighter than* is neither bright nor coloured. So if these relations have no perceptible qualities, how can we perceive them? This problem applies to all empirical relations. We can hear two notes, and hear that one is a harmonic of the other, but the relation of *harmonic* makes no sound. We can weigh two stones, one in each hand, and feel that the left one is heavier than the right one, but we cannot touch the relation of *heavier than*. And although the colour of this apple *resembles* the colour of that one, *resembles* has no colour.

The second troublesome peculiarity of relations is that they seem to have ephemeral existence. In the first place, the existence of relations is dependent upon the existence of their terms: if you blow out the candle then all the relations *above*, *hotter than, softer than, brighter than,* and *more penetrable than* cease to exist. Quite generally, if any of

the terms of a relation do not exist then the relation cannot exist. Not only this, but relations often cease to exist simply because their terms are moved around. If, for example, your hat is *on* your head and your left foot is *in* its shoe, this *on* and *in* cease to exist if you take off your hat and remove your shoe: a simple rearrangement of their terms destroys this *in* and this *on.*

The third troublesome feature of relations is that many of them multiply extravagantly. Consider the relation *self-similar*, for example: we want to say that it is true of everything whatever that it is exactly similar to itself — simply because nothing can ever be dissimilar to what it is, to any degree. So every relation of self-similarity must itself be self-similar, in which case this second self-similarity must be self-similar, thereby producing a third self-similarity which is self-similar, and on to infinity. Or consider the relation *term of*, which seems to exist between a relation and each of its terms: being a relation, this *term of* has the relation *term of* between itself and each of its terms, and so does each of the new relations of *term of*, producing another infinite series of relations of *term of.* Again, *similarity* is a relation and any two similarities are similar to each other, so that a few similarities produce an infinite number more of them.

These peculiarities of relations incline many philosophers to say that relations are unreal. The real tends to endure, independently of other things, so relations, being ephemeral and having dependent existence, are unreal — like dreams, mirages, and rainbows, which are ephemeral and which have dependent existence. Also, such philosophers say that qualities such as colour, warmth, hardness, solidity, and weight are what make things real, and relations lack these qualities and so are unreal. The best way to characterise all these qualities which relations lack is to say that these qualities are concrete. Then the view of these philosophers can be expressed as: only the concrete is real. Hence relations are unreal. And, thirdly, reality cannot be cluttered with infinities of useless relations: to do so is to multiply entities extravagantly beyond necessity, in defiance of Occam's razor.

However the opposite of *concrete* is not *unreal*; it is *abstract*. As soon as this is understood, the first peculiarity of relations can be explained. Relations are abstract entities. We perceive them because they are there, they exist, they are actual genuine abstract entities; but

they do not have any looks, feels, or other sensory qualities because these qualities are concrete and abstract entities do not have concrete qualities. So you can see that the coffee is *in* the cup because you can see *in*; but *in* does not have any colour, nor taste sweet or bitter, or hot or cold, because colours and tastes are concrete qualities and *in* is an abstract entity.

This is a very troublesome conclusion for common sense. "Abstract entity" seems to be a self-contradictory expression; to be an entity is to be concrete, so that a non-concrete entity is a meaningless form of words, like "square-circle" or "nearly infinite." But if you think about it for a little while you will discover that the concept of entity does not in fact entail that of concreteness. Not only that, but there is no other way in which relations can exist except as entities in their own right; and they have to be abstract because they have no concrete properties. To deny this is to risk being like the fool who saw his first giraffe in a zoo and exclaimed "There ain't no such animal!" And if the relation of *in* between the coffee and the cup was not real, then your coffee could not be really *in* your cup, in which case how could you drink the coffee? In fact, all that is required is a little practice in thinking of relations as real, abstract, entities.

This ties in quite well with what we have discovered so far. Recall that the *structure* of a thing is all the relations between all the parts of that thing. We perceive things in our empirical worlds and can quite truly describe these things as structures of sensory, concrete, secondary, qualities. The china cup is a structure of hardness and whiteness; an orange is a structure of orange colour, juiciness, and sweetness; a book is a structure of pages, which are structures of soft, flexible, white sensations which we call paper and which have structures of black marks on them which we call print; and so on. Such descriptions are anathema to a common sense realist, but we have left common sense realism behind. All sensory qualities are secondary qualities: qualities manufactured by the sense organs and hence illusory, false, unreal — mere representations of parts of reality. What is true in empirical worlds is most probably the findings of empirical science; and the most probable of these are the mathematical findings; and mathematics is the language of relations; so it is the potentially

universally public relations in empirical worlds which are the most probably true. Empirical reality consists of these relations.

Concrete qualities are the terms of the relations that we perceive: they are what the relations relate. Since relations cannot exist without their terms — this is the dependent existence feature of relations — the concrete qualities have to exist in order for us to perceive the empirical relations. If we did not perceive the terms, we could not perceive the relations. This is why our senses manufacture concrete secondary qualities for us: so that we can perceive relations which are the true features of empirical worlds. These empirical relations are mainly true because they are similar to parts of the structure of reality. From an evolutionary point of view, perception of relations has survival value. For example, to recognise a leaf as one of stinging nettle or of poison ivy is to perceive a *similarity* between this leaf and a remembered leaf which caused pain; or to perceive that this branch is *too weak* to bear one's weight, that that ice is *too thin* to walk on, that curve is *too sharp* for this speed — all these are perceptions of relations having survival value.

From the observation that the empirically true is relations, we can come to a metaphysical conclusion: reality is a structure. In fact, we shall discover that it is a single structure, a unity.

However, this reveals another common sense belief that we must abandon, another separation between us and the sophists: the belief that only the concrete is real. Because the concrete is illusory. The red of the ripe tomato is produced by electromagnetic radiation of a frequency of about 330 terahertz entering the real eye, and this radiation is reflected off the real tomato because its skin has a certain molecular structure; so the sensory red of the empirical tomato is an image of the molecular structure of the real tomato, and as such this image is mostly illusory — since the molecular structure is not concrete and has an enormous amount of detail that the red sensation lacks. Because the concrete is illusory it follows that only the abstract is real — only relations are real. Reality is mathematical. "All is number" as Pythagoras said long ago.

Clearly, the road to the profound is not easy.

The second peculiarity of relations is their dependent existence: destroy one or more terms of a relation, or rearrange its terms in certain

ways, and you destroy the relation as well. This is only one side of the coin, however; the other side is that relations come into existence just as easily as they go out of it. This coming into existence is *emergence*, and the going out of existence is *submergence*. If you put the cup back on to the saucer the relation *on* emerges — seemingly out of nothing. Arrange a certain number of musical notes in a certain way and a relation that we call a *melody* emerges; rearrange them in another way and the melody does not emerge. Arrange the parts of a car engine in a certain way and the relation of *working order* emerges; rearrange them in a different way and it submerges.

Although empirical relations usually have concrete terms, it does not follow that all relations do; in fact, most relations do not have concrete terms, they have abstract terms. That is, the terms of most relations are other relations, or properties of other relations. This allows the possibility of cascading emergence, which occurs when, given the existence of some relations as terms, other relations emerge out of them and these in their turn are terms of further emergent relations, and so on, indefinitely. Relate neutrons, electrons, and protons and atoms emerge, giving the chemical elements; relate atoms, and molecules emerge, giving chemistry; relate the appropriate molecules, and cells emerge, with other emergents such as life, reproduction, and metabolism; relate cells, and organisms emerge, such as plants and animals, with other emergents such as nervous systems and consciousness; relate organisms, and societies and ecosystems emerge. And so on. These organisms, ecosystems, etc. are, of course, theoretically real, not empirical; they are structures having no secondary qualities, no concrete properties. Concrete properties belong only to the images of them, the empirical organisms and empirical ecosystems.

The properties of a relation emerge and submerge with it, but the terms of a relation do not. And when a relation emerges it unifies its terms. It is because of this that a whole is greater than the sum of its parts: the sum of the parts is the totality of the terms, and the whole is this plus the emergent relation; and since the relation unifies its parts, every whole is a unity.

The third peculiarity of relations, the extravagant multiplication of some of them, is cured by appeal to the medieval philosopher

William of Occam[9]. He originated the maxim, now called Occam's Razor, that says: *Do not multiply entities beyond necessity*. This means that when inventing explanations of empirical phenomena you should not invent more theoretical entities than are needed to explain the empirical facts. Scientists have a similar principle that they call the principle of parsimony of hypothesis, a somewhat pompous expression for the popular KISS principle — Keep It Simple, Simon. We keep it simple by saying that infinite multiplications of relations are not necessary to explain any empirical phenomena, so relations that multiply this way are merely *nominal relations*, they do not exist except as names. *Self-similarity*, *self-identity*, and all other monadic, or one-term, relations, as well as relations such as *term of*, do not exist except in language. And relations of similarity must be assumed to exist only in so far as they are necessary to explain the empirical facts.

[9] The original spelling of Occam was Ockham, a corruption of the name Oak Hamlet.

17: Affirmation of Relations

Relations always have a property called adicity, which is the number of terms that they possess, the number of *relata* that they relate. Every relation has adicity and only relations have it. This property of adicity will later be the basis of the definition of number. One could, if one wished, make adicity the most primitive concept, and then define relations as anything having adicity; then natural number would be the most primitive concept in mathematics.

Another feature of relations is that they are simple: they are not compounded out of other relations, they have no parts, they have no structure. The multiplicity of terms of a relation must not be confused with its simplicity: the terms are many, the relation is one; the relation is an abstract entity which is conceptually, numerically, and existentially distinct from its terms. In particular, a relation cannot be defined by means of the set of its terms, since relations often have properties not possessed by any of their terms, nor possessed by the whole set of their terms. For example, a melody has properties not possessed by any of the notes that constitute it, nor by the whole set of these notes: these properties emerge only with a special arrangement of the whole set of these notes.

Besides having terms, relations have various properties which emerge and submerge with the relations. Such properties are either intrinsic or extrinsic. The colour of your eyes is an intrinsic property of you, as are your intelligence and your health. But *where* you now are — inside or outside, upstairs or down, in sunshine or rain — is an extrinsic property of you, as are your height and weight *relative* to someone else. Intrinsic properties give us no trouble, because they are quite familiar: they distinguish one kind of thing from another, such that we can say that the kind of a thing is the totality of its intrinsic properties. A thing could in principle exist in isolation, all by itself, and it would have all of its intrinsic properties; but it would not have any extrinsic properties.

Extrinsic properties are of two kinds: upper and lower. If Jack is *taller than* Jill then Jack has the upper extrinsic property of being taller than Jill, and Jill has the upper extrinsic property of being shorter than Jack, while the relation *taller than* has the two lower extrinsic properties of Jack and Jill. That is, to be related to something is to have an upper extrinsic property, and to be a term of a relation is to be a

lower extrinsic property of that relation. So it turns out that *term of* is meaningful: it is not a relation, because if it were it would multiply extravagantly; instead it is a lower extrinsic property of a relation. This is important, because we do want to be able to assert or deny that something is a term of a given relation, as the case may be, and we can only do this if *term of* is meaningful.

In order to keep things simple, by conforming to everyday language, we will abandon the words upper and lower extrinsic properties, and intrinsic properties, in favour of *extrinsic property*, *term of*, and *property*, respectively. Thus every relation has properties, which determine what kind of relation it is, as well as terms, which are all the things that it relates, and extrinsic properties, which are all the relations of which it is a term.

With one exception, the terms of every relation are either other relations, or else properties of relations. The exception is relations which have concrete qualities as their terms; these are either empirical relations, or else relations in the concrete imagination or memory: perceived relations between perceived concrete qualities, or imagined or remembered relations between imagined or remembered concrete qualities. We will ignore this exception for now, and deal further with the nature of concrete qualities later.

Because relations are simple they are unities: having no parts, they are each one. Because of this they unify their terms. Two particular ways in which this may happen are: the terms of a relation may be unified into a *set*, and into a *whole*.

The relation which unifies its terms into a set is called a *set relation*, and is notable for being the relation with the fewest properties: a set relation has only the one property of a particular adicity.

A relation which unifies its terms into a whole is called a *novel relation*, because it has at least one property not possessed by any of its terms, its terms of its terms, or any lower level term. For example, a single celled animal possesses the property of life, which is not possessed by any of its: parts: the molecules that compose it, the atoms that compose the molecules, the wave-particles that compose the atoms, etc. Or consider an old-fashioned mechanical clock, consisting of a weight suspended on a chain which goes around a sprocket which

connects, via various gear wheels, to an escapement controlled by a pendulum and to two hands which rotate around a clock face. Such a clock may or may not have the emergent relation called *in working order*. None of the parts have this emergent relation, and the properties of *in working order* cannot be analysed into smaller relations.

The relation *in working order* is one which emerges in machines. Since a machine may be built out of lesser machines, it is possible for a machine to be in working order and to have parts which are in working order — in which case the emergent *in working order* may exist in some of the parts as well as in the whole. A car, for example, is made of lesser machines such as the engine, the starter, the transmission, the windshield wiper system, the clock on the dashboard and the door locks; each of these may or may not be in working in order, as may the car as a whole. Because of this we can speak of the degree of working order of the car, which varies from perfect working order down to nothing, depending on how many of the lesser machines have this emergent. Perfect working order of the car includes the emergent working order of the car as a whole, as well as the novel emergent relations of *convenience* and *transportability*.

What this means is that as we go to higher and higher levels of structure, at any one level an emergent may appear; when it does it is novel, in the sense of not having appeared at any lower level. But it may also reappear at still higher levels, and when it does so it is no longer novel in this sense. Thus *in working order* is novel in the mechanical clock, but not in the car. It is novel emergents which most clearly cannot be explained in terms of lesser parts or structure, by the very fact of their novelty. But emergents which are not novel cannot be explained in terms of parts or structure either. If all the sub-machines of a car are in working order, it does not follow that the whole car is as well. The sub-machines may not be correctly arranged relative to each other: the starter motor could be in working order but on the back seat, in which case the car would not be in working order.

Because an emergent relation is simple it is a unity. This unity of emergent relations is what makes a whole a whole, as opposed to a collection of parts, because a whole has a unity which a mere collection of parts does not. A machine assembled and in working order is a whole and has a unity that it did not have before it was assembled,

when it was a mere collection of parts: this unity is the unity of the emergent *in working order*, and any other emergents that the assembled machine might have.

Also, it is one or more emergent relations which explain the old saying that the whole is greater than the sum of its parts — since the excess is these emergent relations. A house is greater than all the bricks, pieces of wood and metal, etc. that are its parts, as is shown by the clear difference between all the delivered parts on the building site, and the completed house: the house is greater than the totality of all the parts by all the emergent relations which we summarise with the word *habitable*. This is shown by the obvious fact that the newly delivered parts are not a habitable house.

Furthermore, it is the novelty of emergents which makes it impossible to explain the whole exclusively in terms of the parts. The habitability of the house is not explained by the arrangement of the bricks, let alone by only the bricks; nor by the connections between the electric wires and the connections between the water pipes, let alone by only the wires and pipes; the habitability is explained by emergents from these arrangements and connections.

The attempt to explain everything exclusively in terms of parts is called reductionism. The most extravagant examples of reductionism are the attempts to explain mind exclusively in terms of brain, and life exclusively in terms of chemistry. Reductionism is very popular among those sophists who are determined to believe that only the concrete is real, since the emergent relations that reductionists try to deny are both abstract and real.

Life and mind are in fact two of the most important emergent relations we know of. We are going to examine life in greater detail shortly, and mind after that. But first we must look at a very important property of emergents: every emergent relation has a value. This is a value in the human sense of being valuable, and it is a value in an absolute and objective sense, which can, in principle at least, be calculated. These values are the metaphysical basis of human, subjective values; and in so far as the values of these emergents can be understood, so can human values be explained.

18: Absolute Values

The value of an emergent relation is called its hekergy. Hekergies are in principle simply calculated and are absolute values; we will discover that they are the basis of human values, hence a means to discovery of the nature of the good and the beautiful. The definition of hekergy is a little intimidating at first because it involves the mathematical concept of logarithm; but this is easily explained, as we shall see.

In order to define hekergy we assume a particular emergent relation, E, and a set of terms out of which E emerges. For example, E might be the emergent relation *in working order* and then the set of terms is all the parts of the machine in which E emerges. There are various ways in which the terms may be arranged; in some of these arrangements E will emerge, and in others E will not emerge. Basically, the fewer arrangements there are in which E emerges, the more valuable E is, the greater the hekergy of E. Maximum possible hekergy occurs when there is only one possible way of arranging the parts so that E emerges; this maximum hekergy is *perfection*. As is well known, if you try rearranging the parts of something perfect, the perfection is damaged. A perfect rendition of a perfect piece of music, for example, is ruined if two different notes are interchanged; and a perfectly tuned car engine has its perfection of tuning ruined if any tuning adjustment is altered. A simpler case is a jigsaw puzzle in which no two pieces have the same shape: there is only one way in which the puzzle can be assembled perfectly.

Let us call the number of arrangements of terms in which E emerges, e, and let the total number of possible arrangements of all these terms be t. From what we have said so far, the smaller the value of e, the greater the hekergy of E — up to perfection when $e = 1$. However e is not the only element in the hekergy of E. A very complicated machine is more difficult to put into working order than a simple one, so that the working order of the complicated machine is more valuable and so should have a higher hekergy. This greater hekergy can be accounted for with the number t, the total number of possible arrangements of the parts, since the more complicated a structure is the more terms it has and hence the greater the variety of possible arrangements of its terms — and this last is t. So the hekergy

of E varies inversely as *e* and directly as *t*, as a mathematician would say: the hekergy of E increases either as *e* decreases or as *t* increases. Hence the hekergy of E is proportional to the fraction *t/e*.

One more step is required to define hekergy fully, but first something must be said about the ratio *t/e*. In fact, we will first of all say something about its reciprocal, *e/t*; it is, from a mathematical point of view, a probability[10]. Let us take an elementary example to illustrate this. Suppose that you have a well shuffled deck of cards, and you want to know the probability of drawing an ace, given that you may draw one card blindly from the deck. The probability in this case is easy to see: there are 52 cards in the deck and there are 4 aces, so the probability of drawing an ace is 4/52, or 1/13. If there were more aces, the chances of drawing any one of them would increase; and if there were more cards other than aces in the deck, the chances would decrease: so the probability is proportional to the number, 4, of aces and inversely proportional to the total number, 52, of cards. In an analogous way, if there are *t* arrangements of terms, of which *e* produce the emergent E, then if the terms were arranged at random the probability of E appearing would be *e/t*.

If *e/t* is a probability then *t/e* is an improbability. So, since the hekergy of E is proportional to *t/e*, we can say that the more improbable an emergent is, the greater its hekergy.

It is a feature of probabilities that they combine by multiplying. Suppose that you have drawn your first card from the deck and it is an ace; what is the probability of drawing a second ace? There are now 51 cards left in the deck, and 3 aces, so the probability of a second ace is 3/51, or 1/17. But this is *after* you have drawn the first ace; if you were to ask what the probability is of drawing two cards at once, and both of them being aces, the answer would be that it is the two separate probabilities multiplied together: (1/13)×(1/17), or 1/221.

But when in everyday life we combine values — hekergies — we combine them by addition, not by multiplication: the value of three ounces of gold, when combined with the value of four more ounces of gold, is the value of seven ounces of gold, not the value of twelve

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[10]We earlier distinguished three kinds of probability: mathematical, statistical and subjective. The probability we are considering here is mathematical, also know as calculated or LaPlacian probability.

ounces. So we need a mathematical device to convert multiplication to addition, or products to sums. This is a well established function in mathematics, called a logarithm, which is usually abbreviated to ln: the logarithm of a number n is written $\ln(n)$. The important feature of logarithms is that a logarithm of a *product* of two numbers, a and b, is the *sum* of their logarithms: $\ln(a\times b) = \ln(a)+\ln(b)$. And this can be used with division also: the logarithm of the quotient of two numbers a and b is the difference between the logarithms of the numbers: $\ln(a/b)=\ln(a)-\ln(b)$. (We talk more about logarithms in Chapter 33, *Mathematics and Music*.)

So if hekergies are defined by means of improbabilities, which combine as products, and we want them to combine as sums, we simply define the hekergy of E as the logarithm of its improbability: $\ln(t/e)$, which can also be written $\ln(t)-\ln(e)$.

To summarise: a certain number, e, of arrangements of parts, out of the total number, t, of possible arrangements, produces an emergent, E; the ratio t/e is the improbability of E; and the logarithm of this, $\ln(t/e)$, is the hekergy of E.

For example, the simplest kind of arrangement of things is called a permutation: it is the kind of arrangement you get if you arrange things in a line. Calculating permutations is an easy branch of arithmetic. Consider a very simple case: suppose that we have three different letters, and we want to know the hekergy of the emergent *correct alphabetical order*. It does not matter what letters we use, provided that they are all different, so let us use a, b, and c. And we can make clear that we are talking about an arrangement by putting them in parentheses; thus the correct alphabetical ordering is written (abc). There is only one correct alphabetical ordering, so the number e is one. But how many orderings are there altogether — what is the number t? If we consider all possibilities, then there are three possibilities for the first letter: a, b, or c; once that one is chosen, there are two possibilities left for the second; and choosing that leaves only one possibility for the last. If we multiply these possibilities together, the result is $3\times2\times1=6$. The six possible arrangements are (abc), (acb), (bca), (bac), (cab), and (cba). So $t=6$, hence $t/e=6$ and the required hekergy is $\ln(6)=1.8$. (Logarithms may be looked up in mathematical tables or computed on scientific calculators; the values of them given here are very

approximate.) If we had four different letters and wanted to calculate the hekergy of their alphabetical ordering, we would proceed in the same way: there are four possible choices for the first letter, three for the second, two for the third and one for the last; so the total number of possible arrangements, t, is all these numbers multiplied together: $4\times3\times2\times1$, or $t=24$. If we had ten letters, t would be $10\times9\times8\times7\times6\times5\times4\times3\times2\times1 = 3628800$. A product like this, of a number and all the positive whole numbers smaller than it, down to one, is called the factorial of that number. If the number is n, n factorial is symbolised with the exclamation point: $n!$ Thus ten factorial is $10!=3628800$. So if we had ten different letters, the hekergy of their correct alphabetical ordering would be $\ln(3628800)=15$, approximately. If we had a hundred different words, all different, and wanted to arrange them in alphabetical order, as in an index — lexicographical order — and then calculate the hekergy of this ordering, there would be 100! possible arrangements. To the nearest power of ten, $100!=10^{\mathbf{158}}$ (that is, 1 followed by 158 zeroes) and, since we still have $e=1$, the hekergy[11] is $\ln(10^{\mathbf{158}})=158\times\ln(10)=364$.

It might seem that calculating factorials of large numbers is very difficult, but there is in fact a simple formula for doing it, called Stirling's approximation. This is: if n is a large number then $\ln(n!)$ is approximately equal to $n\times\ln(n)-n$. So if we are calculating the hekergy of an emergent from a large number, n, of parts whose arrangements are permutations, then the hekergy of this emergent is $n\times\ln(n)-n-\ln(e)$. (However, it is important to remember that not all arrangements are permutations: two- and three-dimensional structures are not, for instance.)

It is a feature of the logarithm of a number that it is smaller than that number; and the bigger the number is, the greater this effect is — as the above examples show. This means that if we are dealing with the total possible arrangements of, say, cells in a human body, or neural connections in a human brain, we are dealing with huge numbers whose

[11] $\mathrm{Ln}(10^2) = \ln(10\times10) = \ln(10)+\ln(10) = 2\times\ln(10)$; so by similar reasoning, $\ln(10^{\mathbf{158}}) = 158\times\ln(10)$.

numbers of arrangements are vastly more huge[12]; but once we take logarithms we get magnitudes of hekergies which are within the range of our comprehension. This is another reason for defining hekergy in terms of a logarithm.

We can also think of hekergies as variables, as quantitative properties. Suppose that in the 10 letter example above, we allow one error: two letters are out of order. There are 90 ways that this could happen, since any one of the ten letters could be out of order by being interchanged with any one of the nine remaining letters. So our new emergent, "alphabetical order with one error," has a value of e=90; hence its hekergy is ln(3628800/90)=ln(3628800)−ln(90)=11, approximately. We might then consider alphabetical order with two errors, then with three errors, and so on; our hekergies would rapidly go down as the values of e increased.

Another way of thinking about hekergy is that it is a generalisation of *negative entropy*. Entropy is a theoretical concept in physics which has a precise mathematical definition but which is usually described in general terms as a measure of disorder, so that a negative entropy (which is entropy with a minus sign in front of it — it should really be called negated entropy) is a measure of order. Physicists talk about the macrostate of a system, which is its empirically observable state, and various microstates of it, which are molecular arrangements which give rise to that macrostate. A macrostate is some empirical state of a system, such as its temperature and the distribution of this temperature through the system — uniform, say, or a particular temperature gradient from one end of the system to another, as in a fire brick which is red hot at one end and cool at the other. The number, W, of microstates which give rise to a given macrostate is called the thermodynamic probability of that macrostate; and the entropy of that macrostate is then defined as $k\times\ln(W)$, where k is a constant of proportionality known as Boltzmann's constant. Its negative entropy is then simply $-k\times\ln(W)$, or $k\times\ln(1/W)$. One only needs to think of a macrostate being an emergent relation, and a microstate being an arrangement of its terms, to see that negative

[12]But not infinite; for technical reasons too difficult to discuss here, we have to deny the reality of all infinities.

entropy is a special case of hekergy: the main difference being that physicists do not bother with our number *t*, which they do not need. The importance of entropy, in both physics and philosophy, is the *entropy law*, or *second law of thermodynamics* — thermodynamics being the science of the movement of heat. This law requires that entropy, left to itself, increases but does not decrease: as Clausius (1822-88) put it, the universe is "unwinding like a clock, and will end in a universal heat death." Order disappears easily and often irreversibly: you can easily scramble eggs but cannot unscramble them.

One reason that the concept of entropy is significant in philosophy is that one of the greatest physicists of the twentieth century, Erwin Schrödinger (1887-1961), was the first person to give a satisfactory definition of life, using the concept of negative entropy: namely, a living organism is a system in a state of very high negative entropy, in dynamic equilibrium. That is, very high hekergy, in the present context. The dynamic equilibrium that Schrödinger had in mind was that constant losses of negative entropy due to the second law of thermodynamics are replaced by feeding on other high negative entropies — animals or vegetables — or else by feeding on sunlight. The collapse of the dynamic equilibrium is, of course, death.

Suppose now that we think of the real world as a scientist might. Of the great variety of fundamental wave-particles there are three that are here relevant: neutrons, protons, and electrons. They form structures which are atoms — 92 different kinds (not counting isotopes) which occur naturally on Earth, and which are the chemical elements. Atoms form structures which are molecules. Molecules form structures which may be, among other possibilities, cells. Cells form structures which are plants and animals. These in turn form structures which are ecosystems, such as forests and nations. And ecosystems form a single structure which is the biosphere of our planet, Earth. At every level there are emergent relations, which introduce novelty and hekergy. At the atomic level there emerge chemical properties; at the molecular level there emerge a much greater variety of chemical properties; at the cellular level there emerges the very high hekergy in dynamic equilibrium that is life, along with subsidiary emergents such as metabolism, sensitivity, irritability, reproduction, and genetic code. In animal and plant structures there emerge sexual differences and other

specialised functions, such as photosynthesis in plants, and muscles, blood circulation, and nervous systems in animals. In cities and nations there emerge such things as money, crime and punishment, trade unions, social hierarchies, rights and obligations, corporations and industries. All of these emergents are relations, emerging within structures; and all of them have hekergies. So we can take a nation, say, and, in principle if not in fact, calculate the hekergies of all its emergents, and add them together; and do the same for each part of the nation, then each part of each part, and so on down to the smallest parts; the total hekergy would then be the absolute value of that (theoretically real) nation.

In short, the theoretically real world consists of relations, including an incredibly rich variety of emergent relations, all of which have hekergy, or absolute value.

19: The Basis of Human Values

The relation between hekergy, as an absolute value, and our human values, is the next thing to consider. The relation between them is quite a simple one, provided that the process of evolution be thought of, not as a process of chance variations leading through survival of the fittest to higher and higher life forms, but as a process that is driven: a process in which hekergy has to increase. There is a very good reason for supposing this, which we will come to shortly; for the moment let us just suppose it. (This means that another common belief will have to be abandoned: the belief that evolution is the result of chance variations.) Given this evolutionary drive to increase hekergy, every inherited growth pattern and every inherited behaviour pattern will have one thing in common: a need to increase hekergy; or, if this is not possible, a need to preserve the existing hekergy; or, if this is not possible, a need to minimise the loss of hekergy. Higher animals, having consciousness, have to have the ability to recognise and cherish hekergies; we humans certainly do, and we call them values. We need to increase values; or, if we cannot, to preserve them; or, if we cannot, to minimise the loss of them. This need, this drive, to increase hekergy is probably what is meant by the term Holy Ghost in Trinitarian churches; it is the source of creativity and of originality in poetry and music, painting and sculpture, science and mathematics, architecture and engineering; creativity is hekergy increase. We value creativity in all of these activities, and all such creativities produce emergents, which have hekergies, hence values. This drive is also the source of growth, of maturation, of healing, all of which are hekergy increases and valuable. We will talk about human values more when we consider the nature of mind, below; in particular we will consider how they come to be subjective — distorted from their absolute values — by irrationality. For now, we need to consider why it is that evolution is not a chance process, but is driven: and hence evolutionary hekergy explains human values.

The way in which entropy changes, as described by the second law of thermodynamics, is easily explained in theoretical thermodynamics, which is called statistical mechanics by physicists. If it is assumed that every possible microstate is equally probable, like the cards that might be drawn from a well-shuffled deck, and if a system

constantly changes, randomly, from one microstate to another, then it is going to finish up in whatever macrostate is the most probable — that is, in whatever macrostate has the most microstates; and if the probability of this macrostate is enormous compared with all others, then the system is very unlikely to depart from it. So whatever macrostate the system starts with, it will end with the most probable macrostate, which is the one of greatest entropy and lowest hekergy. Thus the second law of thermodynamics says that the entropy of a system increases but does not decrease. It could decrease, but the chances of any significant decrease are so tiny that they may be ignored.

Because of the second law all kinds of processes are irreversible: the processes proceed easily in the direction of entropy increase, but cannot go back again. That is why we cannot unbake a cake or restore our youth; why crockery can fall and shatter, but the shards never bounce back into an intact piece of pottery; why we can burn a candle, but not unburn it; why everything wears out and runs down; why friction works to bring everything to a stop; and why it is much easier to decrease the money in our bank accounts than it is to increase it.

Also because of the second law, nothing travels up a gradient by itself: rivers do not flow uphill, heat will not flow from a cold body to a hot one, wind will not blow without a barometric gradient, electricity will not flow without a voltage, and you cannot dry yourself with a wet towel.

There are two features of statistical mechanics that are particularly significant here. One is that, overall, entropy increases all the time: that is, its direction of change is constant; this is sometimes called time's arrow: we can know which way time is going by the direction of entropy change. The other feature is that this direction of change is accounted for by means of chance, by means of random process. The two of these together are significant because we have encountered them recently in a different context. Evolution is a process of constantly increasing hekergy, or decreasing entropy, and this is explained by chance — chance variations for Darwin, chance mutations and chance gene mixing by sexual reproduction, today.

Let us suppose that the total hekergy of the universe is conserved: it never increases or decreases. Then all that supposed

chance in statistical mechanics cancels out all the supposed chance in evolution and other hekergy increasing processes, and all the hekergy decreases of statistical mechanics are equal and opposite to all the hekergy increases of the hekergy increasing processes, here and in all the other places where these things go on. We can think of the universe as starting with a big bang and possessing enormous thermodynamic hekergies. As time went on, these thermodynamic hekergies decreased and were replaced by hekergies of higher level emergents — those of stars and galaxies, for example. Further time led to greater and greater diminution of thermodynamic hekergies and more and more emergence of higher and higher level relations, whose hekergies maintained the total hekergy of the universe at a constant value. These include the appearance of atoms heavier than helium, planets made out of these atoms, life on some of these planets, and evolution of this life to higher and higher forms, up to and including mind and consciousness. Thus evolution is driven.

This *Principle of Conservation of Hekergy* is at present only a hypothesis; we will try to justify it shortly, but for now it will be enough to consider three advantages of it.

The first is that it gets rid of chance. Chance events are very unsatisfactory because they are inexplicable. As we saw earlier, explanation is causal: to describe causes is to explain their effects. A chance event is an uncaused event, by definition; hence it cannot be explained. And if it cannot be explained then there cannot be any profound truth about it.

The second advantage arises from one of the criteria of good explanation: symmetries are desirable in explanation — hence asymmetries are undesirable. A particular kind of symmetry is symmetry of quantity with time, which is conservation of that quantity. Physics has six principles of conservation — conservation of energy, of linear momentum, of angular momentum, of electric charge, of baryon number, and lepton number; and chemistry has two — conservation of mass and of atomic number. The second law of thermodynamics lacks such symmetry, since entropy is not conserved: it increases with time. And the theory of evolution lacks such symmetry because life evolves to higher and higher forms — hekergy increases. The hypothesis of

conservation of hekergy gets rid of these two asymmetries and replaces them with one symmetry, one principle of conservation of hekergy.

The third advantage is that it is always a good sign when two seemingly disparate explanations can be united into one larger explanation. This is a case of the integration of two theories that is one of the criteria of good explanation. Other examples of this are the union of physics and chemistry by means of quantum theory, the union of optics with electromagnetism through Maxwell's equations, and Schrödinger's unification of physics and biology. Physics and evolution are now united, at least in principle, in that the hekergy decreases of thermodynamics cause the hekergy increases of evolution. Such unification also contributes to the unification of understanding that is part of the progress towards wisdom.

20: Nothing but the Best

We have one more metaphysical task before turning to an examination of the nature of mind: we have to explain why hekergy is conserved. This will require explanation of why our universe — our theoretically real world — rather than any other possible universe, exists. That is, why our universe, out of all possible universes, exists. This in turn provides the escape from solipsism promised earlier (see page 47). The explanation is a little more difficult than any we have met so far, and requires a somewhat longer logical attention span, so some readers may like to skip to the next chapter on their first reading.

We must first of all define existence: you cannot prove something that you cannot define. We can at present only give a partial definition. If by *world* or *universe* we mean the totality of existents then the actual universe is one among all possible universes so it must be at least possible. But only one possible universe exists, by definition, since it is the *totality* of existents, so existence — actuality — is possibility plus something else. Call this extra X, since it is for now unknown. So existence is not just possibility, it is possibility plus X. What X is will be discovered shortly.

Second, we have concluded that our theoretical universe is mathematical, because of the success of the mathematical sciences — particularly in theoretically predicting empirical novelty — and it so happens that mathematicians have a definition of existence. The existence they talk about is mathematical existence, and they define it as possibility: if something is possible in a mathematical structure or axiom system then that thing exists in that system, and if it is not possible then it does not exist.

So the actual existence that we are interested in is, even more clearly, possibility plus X. So for now we will confine ourselves to possible universes which are structures, which are composed of relations, which, in a word, are mathematical. Other possible universes — ones which are possible but not mathematical — will be considered later.

To understand why our actual universe exists, out of all possible universes, we must first consider all possible universes. To do this, we must first eliminate the impossible universes — that is, ones that some might believe to be possible but which are in fact not so. In particular,

there is no possibility of an infinite universe, since the concept of infinity has only nominal meaning — there are no actual infinities. This is a point that is too technical to discuss here[13]; it must be enough to say that the word infinity is like the word chance — we use it to cover ignorance. We speak of chance events when we do not know their causes, and we speak of infinite things when we do not know their limits. So every possible mathematical world is finite. (This does not mean that we can comprehend its finitude, since it may be large way beyond our comprehension and still be finite.)

We can define a possible mathematical world, or universe, as a complete structure. It is not difficult to think of a structure, and then, in thought, add more structure to it. But one cannot go on adding structure to it for ever, because no infinities are possible. So at some point it must become complete: nothing more can be added to it. On the other hand, if it cannot be complete then it cannot be a possible world.

So it is in the nature of a complete structure that, if it exists, it exists alone. Two complete structures cannot exist together, because if they did then each would be added to the other, which is impossible because they are each complete. So of every possible mathematical world we can say that if it exists, it exists exclusively: that is, because it exists, nothing else can exist. This means that we can say something more about X-possibility: whatever it is, only one possible world can have it; X has to be some property which: (i) qualifies possibility, (ii) is necessarily unique to one possible world, and (iii) denies existence to every other possible world — because if two possible worlds had X-possibility then both would exist, which is impossible.

An incomplete structure does not have exclusive existence: if it exists the remainder of it is possible and so exists mathematically, since possibility is mathematical existence. So we need consider only complete structures — possible mathematical worlds.

Next, we can define two kinds of complete structure: a contingent world and a necessary world. We can say that A necessitates B if, given A, B is the only possibility; necessity, in other words, is singular possibility. If, when you add two to three the only possibility is

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[13]See my *Relation Philosophy of Mathematics, Science, and Mind* for a discussion of this point. This book is available from www.sharebooks.ca

five then necessarily you have five; and if, when you step off a roof the only possibility is that you fall to the ground then necessarily you fall to the ground. If something is not necessary then it is contingent; contingency is plural possibility. If you reach blindly into a paper bag of coloured jelly beans, then what colour of jelly bean you pull out is contingent, since the possibilities are more than one: red, green, yellow, etc.

So a contingent world is a complete structure, some or all of whose parts are contingent; that is, they are present in the world contingently. (Some of its parts may be necessitated by other parts, but not all of them.) And a necessary world is a complete structure, all of whose parts are necessary: every part of it is necessitated, usually by some other part or set of parts.

There is one sense in which a necessary world is incomplete. Although it is complete in the sense that no necessary part can be added to it, it might be possible to add a contingent part to it. But then it would be either a contingent world or else an incomplete contingent structure, and in the latter case the remainder of the structure would exist, since it would be possible and possibility is mathematical existence, so it would be a contingent world. Hence although something could be added to a necessary world, it could only be added contingently and then a contingent world would result. So a necessary world is complete in the sense that nothing can be added to it in such a way that it remains a necessary world.

We next consider the variety of necessary worlds. Every necessary world must have a lowest level of relations, which we call its prime level. That is, the terms of a relation are one level lower than the level of that relation, and the terms of their terms are another level lower; so there must be a lowest level — the prime level — because otherwise there would be an infinity of levels, which is not possible[14]. But relations cannot exist without their terms, so it may be thought that prime level relations cannot exist, since there is no lower level to contain their terms. We avoid this difficulty by supposing that prime relations relate other prime relations. For example, a hyphen may be

[14]Those familiar with the work of Aristotle will recognise a close similarity here to his *form*, *matter*, and *prime matter*.

thought of as a relation, separating two words; and a hyphen may also separate two hyphens. So if we think of a long line of hyphens, each of them is both a relation, because of separating two hyphens, and a term, because of being one term of the hyphen on its right and one term of the hyphen on its left. The concept of separator is more general than that of a hyphen, and we might think of prime relations being separators; they might be spatial and temporal separators, for example, and as such be atomic spaces and atomic durations. We need not bother further with actual nature of possible prime relations, except to suppose that that there is a variety of them. Then, depending upon the number of them, and their variety, so may we have a variety of necessary worlds.

Out of its prime level, a possible world emerges necessarily through cascading emergence, up to a single relation at its top level. Its top level has a single relation because if it had several relations then they could be related together, at one level higher, in which case the lower level would not be the top level. And it is because there is only one top relation that the necessary world is complete: no higher level relations are possible because a relation must have at least two terms.

Two numbers appear out of this: the number, p, of prime relations, and the total hekergy, h, of all of the emergent relations that emerge cascadingly out of the prime level. Every possible necessary world has these two numbers. We may define the *quality*, or *goodness*, of such a world by the ratio h/p. The more emergent hekergy it has, for the lower number of prime relations, the better it is.

A little thought shows that every possible necessary world must be unique. If there were two that were exactly alike, they would still represent only one possibility, and we are only concerned with the variety of possible worlds. So we can rank possible necessary worlds according to their goodness and speak of the best of all possible necessary worlds. As we shall discover shortly, there can only be one best: although two different possible worlds might have equal goodness, this is not possible for the best of them all.

Returning now to the X of X-possibility, we note that there are two categories of possibility: intrinsic and extrinsic. Intrinsic possibility is logical consistency, or absence of self-contradiction; this is intrinsic to whatever has it. For example, most mathematical concepts are consistent, but we can easily define one that is not, such as

square-circle. A plane figure in geometry cannot be both square and circular; it is impossible, hence not intrinsically possible. Extrinsic possibility, on the other hand, may be defined as: if something, A, allows the possibility of something else, B, then the possibility of B, given the existence of A, is extrinsic to A. For example, given a set of prime relations, the possibility of cascading emergence is extrinsic to these prime relations.

But necessity is a special case of possibility: it is singular possibility, as opposed to contingency which is plural possibility, or impossibility, which is zero-possibility[15]. So there must be two categories of necessity: intrinsic and extrinsic. Extrinsic necessity may be defined as: if something, A, necessitates the existence of something else, B, then the necessity of B, given the existence of A, is extrinsic to A. For example, given a set of prime relations, the necessity of cascading emergence is extrinsic to these prime relations. Intrinsic necessity, on the other hand, is intrinsic necessary existence: whatever has it has to exist, by its own nature and independently of anything else. And the X of X-possibility is intrinsic necessary existence. Let us call a relation that has intrinsic necessary existence T.

If a necessary world has T then that world has to exist; because T has to exist, and everything in a necessary world is (extrinsically) necessitated by something else. For example, the existence of T necessitates the existence of its terms, and the terms of its terms, and on down to the existence of the prime level relations, and these in turn necessitate the cascading emergence of all the other relations.

But we have seen that the existence of a necessary world excludes the possibility of any other possible necessary world. So at most only one world can contain T.

Also, the world that contains T can only contain one instance of T, since if it contained two or more, the excess would be redundant — and redundancy is contingency, so that a contingent world would result.

Also, the world that contains T must contain T necessarily, since it is not a contingent world. And this necessity must be unique to this

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[15]There is a parallel triad in moral theory: in a given situation, *required action* is a singular possibility, *allowed action* is a plural possibility, and *prohibited action* is a zero possibility.

one world: T must be impossible in every other possible world. So at least one world, and at most one world, must contain T.

This one world must be the best of all possible worlds; and this best, because it is the best, should have a top relation at a higher level than any other possible world. If the novel property of this top relation is intrinsic necessary existence, then the best of all possibles has T both necessarily and exclusively, and so exists both necessarily and exclusively[16].

In other words, T exists at a level that only one possible world can produce, and this world can do so only because it is the best; so only one instance of T is possible; and because T has intrinsic necessary existence, T exists and hence so does the rest of the best of all possible worlds.

However, we still have to consider contingent possible worlds — since we have to consider *all* possible worlds; and we also still have to take into account the difference between mathematical existence and real existence.

We note that any contingent world (i) is infinite, (ii), cannot have a top relation (iii) cannot be unique and (iv) cannot co-exist with a necessary world. It is infinite because, being contingent it is possible for it to have parts added indefinitely; and possibility is existence, so these parts would exist in it, thereby making it infinite. It cannot have a top relation because any other relation could be added at the top, contingently, thereby negating the topness. It cannot be unique because whatever relation made it unique could be possessed, contingently, by another contingent world. And since the best of all possible worlds exists necessarily and exclusively, no contingent world can co-exist with it. In short, a contingent world is not a possible world.

So what about the possibility, raised earlier, of a non-mathematical universe? That is to say, suppose that there is another kind of existence, different from mathematical possibility. We do in fact know of another kind of existence: indubitable existence, the content of solipsism. Let us, for simplicity, make the word ‘I’ refer to

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[16]Those who are familiar with the philsophy of Plotinus (205-270 CE) may interpret this top relation as Plotinus’ One, or God, and its downward necessitating existence as his *emanation* therefrom to *intellect* (real mind), *soul* (ego), *world* (empirical world), and *matter* (concreteness). This will be more comprehensible after we have discussed the nature of mind.

whoever is considering this matter, and 'now' to the time that they are considering it — as we did when considering solipsism. This is because all that I am conscious of, now, exists indubitably: if it did not exist I could not be conscious of it. (It may only have dream existence, or illusory or hallucinatory existence, but it still exists — it must, in order for me to be conscious of it.) This is the totality of strict perceptibles, for me, now. This indubitable existence is a possible minimum world; if anything else exists with it, as an imperceptible for me, now, then it is more than a minimum world — and either way we have a world: it is what we call our actual Universe. This world *seems* to have another kind of existence, different from mathematical existence, and we want to know what the relationship is between the two kinds of existence.

Our actual Universe must be a possible world, since a world is a totality of possible existents, and the actual world must be one among possibles.

So let us, for simplicity, refer to our actual Universe as R (for *real*) and the best of all possible mathematical worlds as M (for *mathematical*). So R has real existence and M has mathematical existence. All other considerations apart, there are five logical possibilities of relations between R and M: (i) R and M have no parts in common, they do not overlap; (ii) all of R is a part of M; (iii) all of M is a part of R; (iv) R and M partly overlap — a part of each is a part of the other, and another part of each is not a part of the other; and (v) R and M are identical.

First, R and M must have something in common, because of the success of mathematical science, and because there are empirical relations in R: your head is *above* your shoulders, for example. So the first possibility is excluded.

Second, if all of R is a part of M then R must be incomplete, in which case R is not a possible world. But R is a possible world. So the second possibility is excluded.

Third, if all of M is a part of R then R must be a contingent world, since the balance of it is added to M, in which case R cannot exist because contingent worlds are impossible. But R does exist. So the third possibility is excluded.

Fourth, if R and M partly overlap then R and M together are a contingent world, which, again, cannot exist: this would mean that R,

the real world, does not exist, and M, the necessarily existent world, does not exist. So the fourth possibility is excluded.

Hence by elimination R and M are identical. The real, actual, Universe that we live in is the best of all possible mathematical worlds, the only possible necessary world.

(Logically there are in fact three other possibilities: none of R exists, none of M exists, and none of either R or M exist; but we have already proved that both exist.)

It follows that in this one best of all possible worlds everything must be caused, since it is a singular possibility, and so there are no chance events, no uncaused events; in other words, chance events are contingent, and there are none such in the necessary world. Consequently everything in the necessary world can in principle be explained, since to describe causes is to explain their effects.

So the best of all possible worlds exists both necessarily and exclusively. This was discovered by Leibniz, who is famous for his claim that this is the best of all possible worlds. He was widely misunderstood because most people, being naive realists, did not understand the distinction between empirical worlds and the theoretically real world, and so did not realise that he was not referring to empirical worlds, but to the theoretical world. The empirical world of each of us is not the best possible, in our own judgment, because we see it subjectively: we selfishly would like our own position in it to be better than it is, or we ethnocentrically would like there to be less tragedy for human beings in it, even though either of these would reduce the overall perfection of the theoretical world. Also, the empirical world of each of us contains no necessities, it seems to be entirely contingent. But these contingencies are, of course, illusions — they are false perceptions. They have to be false, since we have just proved that reality is otherwise. We will return to this later.

In the best of all possible theoretical worlds hekergy must be conserved, since it is the maximum possible. In this way is the hypothesis of conservation of hekergy justified.

The argument of this chapter is a version of what is called the ontological argument, which was first proposed by St. Anselm (1033-1109). He said that he could conceive of a being perfect in all respects; since, if it lacked existence, it would be imperfect with respect to

existence, it had to exist necessarily. He had God in mind as the necessary existent, whereas here it is theoretical reality for which necessary existence is argued. In either case the concept of necessary existence is the key to the argument. And in Chapter 38 we shall see that the theoretical world is one possible interpretation of the word God.

21: Ego and Consciousness.

We next examine the nature of mind. We need to discover what the ego is; how it is conscious, and how it can act; why it is irrational, and how it can be rational; why it is moral, and suffers from conscience, guilt, and shame; how it can evaluate and feel; how it can think; how it can be creative; and, most important of all, how it can become wise, and what wisdom is.

An explanation of all of this is possible because of three things already examined: (i) because of the Leibniz-Russell theory of perception, which requires empirical worlds to be composed of images and so parts of theoretical minds; (ii) because of relational emergence, which allows mind to emerge from brain; and (iii) because mind is relational, and we have seen that relations not only are basic, but biological ones are evolutionally driven to higher hekergies.

We must first reiterate the scientific distinction between the empirical and the theoretical: the empirical is always perceptible, the theoretical is never perceptible, and the empirical is always supposedly caused by the theoretical. Since to describe causes is to explain their effects, theoretical descriptions are explanations of empirical descriptions. The significance here of this explanation of explanation is that our goal is to explain the interesting features of mind, so we are going to have to distinguish between theoretical mind and empirical mind. Empirical mind is all that we know of mind from introspection, such as the meanings and feelings, memories and beliefs that we are conscious of. The empirical world is all that we perceive around us. Theoretical mind[17] is both of these, the empirical mind plus the empirical world, plus all the theoretical mental causes of them, such as theoretical sensations, meanings, feelings, memories, and beliefs, all of which are in the unconscious mind. In other words, the theoretical mind is, to begin with, the empirical mind, the empirical world, and the unconscious mind.

A neural switching in the brain — an on or an off — may be defined as an elementary or atomic idea. This is a theoretical atomic idea, never an empirical one. Structures of these — larger theoretical ideas, or theoretical molecular ideas — are theoretical sensations, and structures of these will be called theoretical images, which we shall see shortly to be the causes of empirical objects. Theoretical images are brought into the brain, hence theoretical mind, in accordance with the causal theory of perception, or

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[17] There is a possibility of confusion here. Suppose that we are talking of, say, a theoretical black hole. This can have two meanings: the idea of a black hole, which idea is part of a theory; and what it refers to — a theoretically real black hole. The adjective *theoretical* is ambiguous, and becomes confusingly so when talking about theoretical mind and theoretical ideas. We should really be talking of *theoretically real mind* and *theoretically real ideas*. But to do so would make our descriptions even more unwieldy, so we will leave it as understood that in this context *theoretical* means *theoretically real*.

theoretical perception, as we called it earlier. Such structures of theoretical sensations are images of parts of the real world, and the empirical objects that they cause, as will be explained shortly, are images of these images — hence empirical objects are images of parts of the real world. The empirical world of this mind is the structure consisting of all of these empirical objects, and the relations between them.

Let us suppose two possible mental operations on theoretical ideas: copying, in whole or in part, and joining together. Copying of these ideas is making images of them. For example, transient inputs — theoretical perceptions — are copied into more or less permanent structures in the mind, in the form of theoretical long-term memories; and parts of theoretical ideas are copied into separate, new, theoretical ideas in the process of abstraction. Secondly, theoretical ideas may be joined together, bonded, more or less permanently, to form larger ideas — as in the cases of association of ideas such as lightning and thunder, the joining of an idea of a word to its meaning, the combining of distinct concrete images as in forming a mental image of a mermaid, and the combining of abstract ideas as in the thought of a triangle which is right-angled.

Let us suppose, secondly, that there is a mind-hekergy principle, according to which the mind must increase its hekergy wherever it can. This principle results from the principle of universal conservation of hekergy, as we have seen: minds are parts of evolution, whose hekergy is driven upwards over time.

A particular case of this principle is the principle that like-attracts-like-and-repels-unlike, or L.A.L.R.U. for short. This is the principle of interaction between theoretical ideas. It may be supposed to be analogous to other principles relating forces between things, such as the gravitational force between two masses, which is proportional to the product of the two masses and inversely proportional to the square of the distance between them. That is, the force between masses m_1 and m_2 separated by distance d is proportional to $(m_1 \times m_2)/d^2$; this is a force which is always attractive. In the case of two electric charges, q_1 and q_2, the force is proportional to $(q_1 \times q_2)/d^2$, and this force is repulsive if q_1 is like q_2 — both positive or both negative — and attractive if they are unlike. Similarly, the force between two theoretical ideas having hekergies H_1 and H_2 and separated by distance d is proportional to $(H_1 \times H_2)/d^2$. However, there is a third factor operating in the forces between ideas: their degree of similarity, S.

This degree of similarity may be defined very easily. Between the corresponding atomic ideas of any two ideas there is either an atomic similarity or an atomic dissimilarity; if the total number of atomic similarities is s and the total number of atomic dissimilarities is d, then the degree of similarity

between the two ideas is $S = s/(s+d)$. If $d = 0$ then the two ideas are exactly similar and S = 1; if $s = 0$, they are completely dissimilar and S = 0; thus the value of S may vary between 0 and 1; and if $s = d$ they are neither similar no dissimilar, but neutral. (Equally, if we wanted to, we could define the degree of dissimilarity as $d/(s+d)$.)[18] Let us suppose that the force between ideas is attractive if it is positive, and repulsive if it is negative; then it will be proportional to $S-½$ and our formula will become $((S-½)\times H_1\times H_2)/d^2$. This is our principle of L.A.L.R.U., or like-attracts-like-and-repels-unlike; it specifies the forces of interaction between ideas. Because of the variety of kinds of hekergy — because of the variety of emergents among ideas — the forces between ideas may be very complex.

In a newborn brain, certain theoretical memories will be largely similar, because of a common element, and so mutually attractive: the common element being that of having the image of that newborn's theoretical body as a key part of the memory. Such common elements make the memories similar to, or like, each other, and hence mutually attractive, by L.A.L.R.U. Being mutually attractive, such memories will move together to form a structure of memories. The key feature of this structure is the common feature of all these memories: an image of the body, which image is the theoretical image body. So this structure represents "me," or is the ego. Thus the ego is a structure of memories that include its own body. Remember that these are theoretical memories of theoretical images of the theoretical body. This ego is the meaning of "I" and "me ," as in "I had a dream that I was disembodied." (A second meaning of "I" and "me," is the empirical body, as in "I fell head over heels"; we will see in a moment how the empirical body comes into existence.)

Because of L.A.L.R.U., any theoretical idea or memory coming close to the ego will produce forces of reaction in the ego. With a large and complex ego, with its large variety of hekergies, these forces will be very complex: combinations of pushes and pulls, bendings and shearings, rotatings and twistings. In particular, various transient theoretical sensations that are structures of atomic ideas will, each in its own characteristic way, produce its own specific reactions in the ego. These reactions are empirical sensations, the ego's consciousness of specific sensory qualities. In this way theoretical sensations produce empirical sensations: the theoretical sensations are structures of atomic ideas which produce reactionary forces in the ego by L.A.L.R.U., and these reactionary forces are the empirical sensations. Notice that there are two elements to this consciousness: reaction to hekergy, H, and

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[18] A more general formula will take account of the possibility that the two ideas do not have the same number of atomic ideas. If one idea has a more atomic ideas than the other then $S=s/(s+d+a)$ and the degree of dissimilarity is $(d+a)/(s+d+a)$.

reaction to degree of similarity, S. The first is a feeling for the ego, and the second is a meaning; feeling is consciousness of value, and meaning is consciousness of structure, as will be further elaborated later.

Given consciousness of empirical sensations, the ego's consciousness of empirical objects is consciousness of structures of empirical sensations, and the whole structure of empirical objects is the ego's empirical world. Not only is the empirical world constantly changing because of the transience of the theoretical ideas — sensory inputs — that produce it, but this empirical world is entirely within the ego, since the reactions to the L.A.L.R.U. forces, which reactions constitute consciousness, are within the ego. So not only is the inside surface of your theoretical skull beyond the blue sky, but so are the outer reaches of your own ego — or, as it might be better to say, so are the outer reaches of you yourself beyond the empirical blue sky. Although your empirical body is another empirical object among empirical objects, and so is within your empirical world, as common sense has it, your empirical world is itself within you yourself as ego. Another belief shock for common sense.

So we might say that, like God, your ego is both transcendent to, and immanent in, your empirical world.

All of this is more complicated than common sense realism, but it is not as complicated as it seems at first. There are two processes, involving three entities. The processes are theoretical perception and empirical perception. Recall that empirical perception is perception as we know it in experience, introspectively, and theoretical perception is the scientific theory of perception which explains empirical perception. The three entities are the real object, which, when theoretically perceived, causes an image of itself to appear in the theoretical brain of the perceiver. This image is our second entity, a structure of theoretical sensations, the theoretical image. This second entity in turn causes the ego to be conscious, by L.A.L.R.U., of a structure of empirical sensations. This structure of empirical sensations is the third entity, the empirical object, and the ego's consciousness of this empirical object is the ego's empirical perception of it. Thus empirical perception is the last stage of the process that is theoretical perception.

Among empirical objects one is especially important to the ego: the ego's own empirical body.

A naive ego will believe, falsely, that the empirical object is the real object. This false belief — common sense, or naive, realism — comes about because the empirical object is outside the ego's empirical body, is public, is reperceptible, is part of a temporal structure having causal coherence, and resists the will of the ego. But a wiser ego understands that the empirical object is within its own empirical world which is within the ego itself: the empirical object *cannot* be identical with the theoretical, or real, object because

qualitative difference entails quantitative difference: the two are qualitatively different, as shown by the fact of illusion, and so must be quantitatively different, hence two.

Besides being conscious of empirical objects the ego can be conscious of empirical memories. The difference is that an empirical object is an ego reaction to a transient theoretical image, while an empirical memory is an ego reaction to one of the theoretical memories that constitute the ego itself — with the exception of very early memories which constitute the central core of the ego. Usually, of course, empirical objects are more vivid than memories of them; we may suppose that this is because the theoretical memories have lower hekergies than the theoretical images.

One feature of each person's empirical world is private to that world and wholly illusory. It is a personal, four-dimensional, co-ordinate system, which is always present. We do not normally think of it in this mathematical way; instead we simply use the names for the various parts of it: the origin of the co-ordinate system is *here, now*, and the four axes are *in front of me, behind me; my left, my right; above me, below me;* and *my past, my future.* This *me* is, of course, the empirical body, which is always at the origin: the ego can always say truly "I am here, now." This co-ordinate system is fixed in the ego, and as the theoretical body moves in the theoretical world, the imaged portions of the theoretical world become the empirical world moving past, or around, the spatial parts of the co-ordinate system: the space of the empirical world moves around the private, permanent, co-ordinate system. Movement in the temporal axis is one directional and, much to the regret of most people, entirely involuntary. That this personal co-ordinate system is illusory is proved by Einstein's theories of relativity, which require that there is no fixed or absolute co-ordinate system — no real co-ordinate system — in the theoretical world.

Common sense is quite used to adjusting between different peoples' co-ordinate systems: we have no difficulty in calling the left side of a facing person their right, for example. But common sense has always been reluctant to generalise more than necessary. Primitive people put their tribe at the centre of the Universe; more developed theories put the whole world at the centre; later still, the Sun becomes the centre. Each move, from anthropocentricism to geocentricism to heliocentricism, is a minimum move further away from the egocentricism of the personal co-ordinate system; a move necessary in order better to explain the empirical facts. Needless to say, the theory of relativity requires that there is no centre of the Universe at all, just as the surface of the Earth, as opposed to the Earth as a sphere, has no centre.

22: Action, Belief, and the Irrational

Because L.A.L.R.U. forces are complex, if the shape or internal structure of the ego changes, the consciousness of the ego alters. Such alteration, properly directed, is a focussing of attention. Not only can the ego focus its attention on the contents of its consciousness but it may focus L.A.L.R.U. forces on to theoretical ideas in its own vicinity in the brain. Among such ideas may be efferent ideas, as opposed to afferent ideas — that is to say, motor ideas as opposed to sensory ideas, or response ideas as opposed to stimulus ideas. Those who are familiar with the basics of computers know that there is no intrinsic difference between computer data and computer commands; they differ only in their relative positions. So must it be with ideas, since afferent and efferent nerves work the same way — they differ only in whether their signals are entering or leaving the brain. It follows that if the ego can manipulate efferent ideas then its action can be explained. It acts by moving theoretical muscles, and this movement is imaged into the theoretical brain and so into the empirical world inside the ego; so the ego has immediate feedback on its willing: it wills a movement, and its empirical body moves accordingly. But the ego is, of course, quite unconscious of all the intervening causal processes: the empirical willing sends a theoretical efferent signal to the theoretical muscle, which moves the theoretical body, which is theoretically perceived as a movement of the theoretically imaged body, which is empirically perceived as a movement of the empirical body — and only the empirical willing and empirical movement are within consciousness.

Two things dominate the consciousness and action of the ego. One is the mind-hekergy principle, which requires the ego to increase hekergy if possible; hekergy increase is good, hekergy decrease is bad, and the ego's experience of these are what we call pleasure and pain. The other is the permanent focussing, or attention, of the ego: the ego's attitude, we might say. This attitude is determined by the central ideas of the ego, the ideas of its own body, the "me" ideas. The combination of these "me" ideas with the mind-hekergy principle is the ego attitude of good-for-me, or selfishness. This requires the ego to increase its own hekergy, to strive for its own good, to act selfishly.

As the ego grows, it not only grows by increase of memories involving its own body, but also by acquisition of beliefs. The more structure the ego has, the higher its hekergy; so it will try to increase its structure. Beliefs are one way of doing this. A belief is a proposition, which is a structure of theoretical ideas, known to the ego as a structure of meanings; but a belief is not merely a proposition. We all know introspectively that there is a great difference between considering a proposition and actually believing it: atheists, for example, can consider the proposition that God exists, without believing it, just

as theists can consider the proposition that God does not exist, without believing it. We can explain this difference by saying that a proposition being considered by the ego is one of which the ego is conscious, in passing; but a proposition believed by the ego is one that has been incorporated into the structure of the ego. A proposition is a structure of theoretical ideas, initially outside the ego, which produces consciousness of meaning, feeling, or both in the ego; if the proposition is sufficiently like the ego, it is attracted by L.A.L.R.U. into the ego and so becomes part of the structure of the ego; if it is not sufficiently like the ego, it is not attracted by L.A.L.R.U. and so passes out of consciousness. The first makes it a belief, the second makes it a passing consideration. Thus an ego will say of a belief that it is *my* belief, "*I* believe," which means in turn that the ego has a piggy-back belief that the main belief is true — as we saw at the beginning of this book.

So an ego consists of memories and beliefs. This is comprehensible enough, in that any ego might well say "I am what I have done and what I have experienced, and I am what I believe." These memories and beliefs, remember, are theoretical ones, not empirical ones; the empirical ones are the ego's consciousness caused by the theoretical ones.

A belief may easily turn into a prejudice, which is a minor complex of ideas based on a belief. A prejudice forms around a belief by selection of evidence. Evidence which is supportive of the belief is like it, and so attracted to it by L.A.L.R.U., while contrary evidence is unlike and so repelled from it by L.A.L.R.U. The belief and all of the supporting evidence constitute a prejudice. This process of selection is of course unconscious: all the ego is conscious of is the belief, plus a great deal of evidence supporting it and no contrary evidence, which makes the prejudice obviously true to the ego. We all are conscious of prejudices in other people, when we do not have similar prejudices ourselves, because we recognise that evidence has been selected; but to spot our own prejudices, let alone correct them, is much more difficult — although necessary in the search for profound truth.

L.A.L.R.U. ordering of ideas is irrationality. The mind orders ideas in this way because it is an effortless way to increase the hekergy of their ordering, and the mind-hekergy principle drives the mind to increase hekergy if it can. Left to themselves, without L.A.L.R.U., the ordering of ideas would be largely chaotic, and so of little hekergy. As a result of L.A.L.R.U., they become more ordered, emergents appear, and their overall hekergy is higher. For example, the ego is a structure of more than chaotic ordering, and it has very valuable emergents, such as consciousness and the power to act. However the ego is both selfish and prejudiced: two features of mind that are essentially irrational, and both of which are produced by L.A.L.R.U. We can generalise

this and say that all L.A.L.R.U. ordering of ideas is irrational: further explanations of mind in terms of L.A.L.R.U. will bear this out.

23: Discrimination and Language

We next consider discrimination, which is a feature of ego activity explained by means of recognition and special kinds of mapping, or copying, of ideas. Recognition, first of all, occurs when the present content of consciousness is similar to a memory; the memory is attracted into consciousness by L.A.L.R.U. and the ego is conscious of both the present content, the memory, and the similarity between them — the three together being recognition. Usually recognition is followed by identification — by naming (as will be explained in a moment) — but we easily recognise without identification: as animals do.

One kind of a special mapping is a copying of a minimal piece of each of two sensations, which leads to consciousness of a similarity between them, in which case the first will be known to be like the second, whereas a dissimilarity will lead to them being unlike. Copying of a minimal piece is a special kind of copying, which is the basis of discrimination between sensations. For example, if the two sensations are colours the ego, once it can talk, will say of them either "This colour is like that" or "This colour is unlike that," depending on whether the minimal copies are like or unlike. Another special case of copying is copying of a boundary — a boundary being a series of relations of dissimilarity; comparison of two results of such copyings will lead to consciousness of them being alike, or not, in shape, since shape — an emergent — is all that such a copying yields. Another special case is copying with enlargement or diminution, leading to consciousness of *smaller than* and *larger than*; if these are one-dimensional then relations such as *wider than, shorter than,* etc. will appear in the ego's consciousness. For example, if Jill is taller than Jack then a copying of Jack that makes him equal in height — like, in this respect — to Jill will lead to *shorter than*, because of the enlargement. All discrimination can be explained in this way: special copyings, and relations of similarity or dissimilarity, or degrees of these, between the copies.

Language is explained by means of special bondings of triples of ideas: an idea which is a meaning of a word, an efferent idea which moves the muscles to produce the word for that meaning, and a memory of that word. Or rather, this is the situation in the case of a child learning to talk; later, when the child can write, and also speak more than one language and know synonyms, the bondings are more complex. Thus one meaning may have efferent ideas for a number of words, plus memories of those words: written words as well as spoken, foreign words, and synonyms. In every case, when the ego wills the word to be spoken or written, the relevant efferent idea is activated and the word is produced, by the theoretical muscles, in the real world. Images of the word then appear as theoretically perceived objects in the theoretical brains of every real person nearby in the real world, so that they all become conscious of

their own image of it: their own empirical word. In particular, the communicating ego can compare its own empirical word with its memory of the word: a feedback loop which enables the ego to monitor what it is saying or writing. Each of the other real people will recognise the empirical word and, because this word is bonded to a meaning in that person's mind, that person will also be conscious of the meaning of the word. Thus the first ego will have communicated a meaning to all the others by means of a word. This assumes that they are all familiar with that word: they all have a memory of it joined to a meaning, in their minds — and their meaning is similar to the meaning in the mind of the communicating ego; these meanings are learnt in the first place by ostensive definition — by pointing at a thing while saying the word for it. Structures of words can then communicate structures of meanings: sentences can communicate propositions; and structures of structures of words can communicate structures of structures of meanings: speeches or books can communicate descriptions and explanations, as with your present reading of this book.

A quite general kind of discrimination occurs when the ego distinguishes between the structure of an empirical object, and its hekergy. Consciousness of structure is consciousness of meaning, which is experienced as thought; and consciousness of hekergy is consciousness of value, which is experienced as feeling. A more complex ego — i.e., a more mature ego — will be conscious of relations as opposed to sensations; this will be consciousness of the abstract, as opposed to consciousness of the concrete. Quite apart from abstract thought, a lot of ego activity consists in consciousness of relations, such as spatial and temporal relations, causations, and similarities and dissimilarities.

24: Conflict and the Oge

If we define an agent as anything that is conscious of its surroundings, has some control over them and has goals within them, then the ego is clearly an agent. For common sense there is only the one agent in each individual: it may be called the soul, the self, or 'I' and 'me', but whatever it is called it is, for common sense, in sole charge, the captain of the ship and master of its destiny. By now, there should be no surprise in discovering that common sense is wrong again, a belief shock that is very easy to prove.

The proof comes from the fact of internal conflict, as in conflict between inclination and duty, and neurotic conflict in the form of various inhibitions of, and compulsions to, the will of the ego.

The minimum necessary conditions for conflict are: (i) at least two agents, having (ii) mutually exclusive goals in (iii) a common situation. Thus all wars, fights, team games, and recreational games such as chess, bridge, and poker have at least two sides, each of which has at least one agent, and mutually exclusive goals in a common situation, in which each side strives for victory, with victory for one side being defeat for the others.

Inclination and duty usually are mutually exclusive, and most people are quite familiar with the internal conflict that may occur with them. And inhibitions, which prevent the ego from doing what it wants to, and compulsions, which make the ego do what it does not want to do, are always at odds with the desires of the ego. So the fact of such internal conflict requires that there must be at least two internal agents: the ego and some other agent. This second agent is here called the oge, which is *ego* spelled backwards, and which rhymes with *bogey*. The oge must be conscious of the same surroundings as the ego, and have some control over them. This means that it must have its own empirical world, produced inside the oge by the same theoretical images that produce the ego's empirical world, and it must have some similar motor control over the theoretical body, via efferent nerves, that the ego has. Thus when there is a conflict between what the ego and the oge want the body to do, and the oge wins, then the ego has been either inhibited or compelled, by the oge.

For example, shyness is one kind of inhibition: the ego might see someone at a party whom it finds very sexually attractive, and want to go over and make advances; if shyness prevents it from doing so, it is inhibited from doing so. As all shy people know, shyness can produce a lot of internal conflict which usually results in defeat for the ego. Timidity, indecision, impotence and frigidity, are other obvious examples of inhibition. Equally the ego might be quite unable to stop biting its nails, blushing with self-consciousness, blurting out solecisms, lying unnecessarily, or any other compulsive behaviour originating either with the oge or in response to oge forces.

It might be thought that this analysis is incorrect, since there are obvious cases of conflict in which there are not two or more agents. Conflict of wind and tide, for example, or conflict of appetites. But these are not proper conflicts. The conflict of wind and tide is only a poetic description of a special kind of turbulence, and the so called conflict of appetites represents only a difficult choice. Appetites are like forces: when two are opposed, the stronger overcomes, or else incorporates, the weaker. This is not conflict, because there are no agents fighting for victory, there is no consciousness and action opposing another consciousness and action, as in a chess game. As in the chess game, internal conflict may go on for a long time, with the outcome long in doubt as one side or the other gains some advantage. This does not happen when, for example, a sensualist has to choose between food and sex — unless, of course, he is compulsively indecisive!

In the present theory of mind the oge develops as naturally as the ego, by L.A.L.R.U. Basically, all memories that are unlike the ego are repelled from the ego, by L.A.L.R.U., and are attracted to each other, again by L.A.L.R.U., to form a second structure, which is conscious, by L.A.L.R.U., and can act, by L.A.L.R.U., for precisely the same reasons that the ego is and can. The reason that there are memories which are both unlike the ego and like each other is that the ego has memories of other people. These memories are all like each other, in being memories of people, and unlike the ego in being memories of people other than the person of ego. Being mutually attractive, they cluster together to form a structure, the oge; and being unlike the ego, this structure is separate from the ego.

This is a very young oge, opposite a very young ego. As they grow with age they become more complex. One reason for this is that we have to explain the fact that everyone is perfectly capable of empirically remembering other people: if all theoretical memories of other people go to the oge, how can the ego remember them? Also, all theoretical memories of other people are double memories: they involve both the other empirical person and the empirical body of the ego. How can a single double memory go two ways — to both the ego and the oge? There are two explanations of this, depending on whether the ego and oge are mature or not. In an immature ego the single memory goes either to the ego or the oge according to the attitude of the other person in the memory: if that person approves of the ego's behaviour in the memory, the memory goes to the ego, and otherwise it goes to the oge. This happens by L.A.L.R.U. because approval makes the memory more like the ego and disapproval makes it more unlike.

But when the ego and oge are more mature we have to suppose that they are each able to manufacture their own long term memories out of

transient perceptions, and these long term memories go into the structure of each.

Memories of other people differ among themselves, and as far as the ego is concerned the most important difference is in their attitude towards the ego. These attitudes vary between the extremes of loving the ego and hating the ego.

25: Love and Hate

The best definition of love is that it is a willingness to give unconditionally, to give without expectation of a return — unlike trade, and the giving of a favour, in which a return is generally due. In giving, the donor raises the hekergy of the donee, at the expense of the donor. Parental love is a willingness to feed, clothe, and cherish an infant, later a child and a teenager, at considerable expense and without much return beyond a beaming smile, and gratification at success. Hatred towards someone, on the other hand is a desire to diminish the hekergy of that person, or at least to prevent their having an increase of hekergy. When less extreme, hate becomes hostility, and love becomes liking; and neutrality between them is relative indifference: the common attitude towards strangers.

We must digress briefly on the nature of love. For the ego to give unconditionally to its beloved is to diminish itself and to enrich the beloved. But according to the mind hekergy principle, the ego cannot diminish itself. How then can love be possible in the present theory of mind? The answer is simple, and will be given as soon as the structure of the oge has been explained.

In order to explain the structure of the oge, we must first say something of the structure of the ego. Anything that will increase the hekergy of the ego is like the central attitude of the ego, which is the need to increase the ego's own hekergy, or selfishness. So all ego memories of loving people will be attracted to the ego, by L.A.L.R.U., as well as being attracted towards each other because of their mutual likeness of loving the ego. And equally, of course, all hostile ego memories will be unlike the ego and so repelled, while being like each other and so mutually attractive. Even though these hostile memories are repelled, they are still part of the ego — because they are ego memories, manufactured by a mature ego. Their existence within the ego causes the structure of the ego to become polarised: memories of loving people at one pole and hating people at the other. We get even finer detail in the structure of the ego by recognising that all the memories of one particular person will be mutually attractive and so form a structure in their own right. We may call such a structure an ego-person, and distinguish ego-people by their relations to the ego: the ego-mother is all the memories of the ego's mother, and similarly with the ego-father, ego-siblings, ego-friends, ego-acquaintances, ego-strangers, ego-foreigners, and ego-enemies. All of these are structures of double memories, with the memory of me closer to the ego and the memory of the other farther away. Thus the ego is roughly spherical in shape, with me-memories towards the centre. This sphere has the two poles: the loving pole, where all the ego-loving ego-people are, and the hating pole, where all the ego-hating ego-people are, with various degrees of loving and hating in between.

25: LOVE AND HATE

There is a good reason, which we will discover shortly, to call the loving portion of the ego the sky ego, and the hating portion the underground ego. The most loving part of the sky ego is the good pole, and the most hating part of the underground ego is the evil pole.

If all this is somewhat confusing at first, remember that all these ego people are not empirical people; they are theoretically real memories, copies of theoretical-image-people, which in turn are copies of theoretically real people in the theoretically real world; when the ego remembers someone, it is conscious of a remembered empirical person and this latter is caused by, and the effect of, the theoretically real memory of that person; and this theoretically real memory is the ego person.

We can now consider the structure of the oge. In one respect the oge is very similar to the ego, and in another it is very different. It is very similar in that it is composed of theoretical memories of different people, each of which forms its own substructure of the oge: oge-people such as the oge-mother, the oge-brother, the oge-aunt, the oge-friend, the oge-teacher, the oge-stranger, the oge-foreigner, and the oge-enemy. And it is very different in that although these oge-people are all repelled from the ego because they are unlike the ego in their otherness, yet they are mutually attracted by their common humanity. The result of both of these is that they form a shell around the ego. The ego is approximately a sphere and the oge is approximately a hollow shell around it — like the blue sky around one's empirical world. Or we might say that , like God, your oge transcends your ego, which both transcends and is immanent to your empirical world.

The variety of oge people within the oge cause it to become polarised, just as the ego becomes polarised: ego-loving oge-people at the good pole and ego-hating oge-people at the evil pole. And the polarisation of each of the ego and oge will reinforce the polarisation of the other, by L.A.L.R.U. So the good pole of the oge is opposite the good pole of the ego, and the evil pole opposite the evil pole and we may speak of the sky oge and the underground oge.

Oge people are formed out of memories of people denying the ego's selfishness. Selfishness legitimately denied is the basis of morality and honour, and so the central attitude of the sky oge is moral and honourable. And selfishness illegitimately denied is the basis of crime and so the attitude of the underground part of the oge is predatory. The ego is concerned with the good of the ego, the sky oge is also concerned with its own good, which is the good of society, and the underground oge is also concerned with its own good; in each case the good is increase of hekergy. Selfishness leads to ego hekergy increase, morality leads to social hekergy increase, and war and crime lead to the hekergy increase of the enemy — or, if not increase in each case, then preservation, and if not preservation then minimization of the decrease.

Each of these hekergy gains is at the expense of one or both of the other two agents. The theoretical body of the individual will act in the theoretical world so as to increase local hekergy in some way, and the ownership of this hekergy depends on which of the three agents is victor in the three way struggle between ego, sky oge, and underground oge. Basically, ownership by an agent of some empirical object is control of that object, although legal ownership is somewhat more complex than this, and includes oge consent to that control, and other non-empirical emergents such as rights and monetary wealth.

Love, by the ego, of another person, can now be explained. In loving an oge person, the ego person of the beloved and the oge person of the beloved join together to become one complex, at once part of the ego and part of the oge. For the ego to enrich this complex is for it to transfer hekergy from one part of itself to another, which is quite possible under the mind hekergy principle. This joining is sometimes called *bonding*, sometimes *identification*. It is the beginning of the end to ego-oge conflict, the beginning of ego-oge harmony.

26: Introjection and Projection

The oge also, like the ego, increases its structure with beliefs as well as memories. These beliefs are acquired primarily by what psychologists call introjection. A memory of someone strongly expressing an opinion will form part of the oge not only as a memory, but also as that opinion being a belief of that oge-person. And presumably oge-people may develop their own beliefs, as does the ego, by independent thinking — although, since each oge-person is much smaller than the ego, this will be less significant than introjection.

The arrangement of ego-persons within the structure of the ego is generally similar to the arrangement of oge-persons within the oge, and by L.A.L.R.U. they will be opposite to each other: ego-John opposite oge-John, and so on. This means that when another theoretically real person, theoretically-real-John, say, is theoretically perceived, so as to appear in the theoretical mind of the ego as a theoretical image, theoretical-image-John, say, then the theoretical-image-John will move around, by L.A.L.R.U., so as to present itself to ego-John and oge-John. This ego-John and oge-John are memories of theoretical-image-John. Theoretical-image-John will also cause the ego to be conscious of empirical-John. So oge-John will be between the ego's empirical-John and theoretical-image-John. In short, theoretically-real-John produces theoretical-image-John so that ego-John and oge-John are between theoretical-image-John and empirical-John. This means that the ego's consciousness of John — the empirical person, empirical-John — will be filtered thorough ego-John and oge-John.

This filtering is what psychologists refer to as projection. They incorrectly call it this because they are naive realists, for whom the mind is in the ego's empirical head. So what goes from the mind onto another empirical person, external to the ego's empirical head, must be "projected" from inside this head onto that person. But as we saw earlier, such a theory is incoherent — quite apart from the fact that there is no possible mechanism for such projection. But the filtering we are speaking of is not problematic at all: it is analogous to seeing things through a stained glass window, so that what is seen is coloured by the glass.

If the oge is a complete sphere around the ego then every ego perception of another empirical person will be filtered through the oge in this way. This filtering is comprehensible enough in obvious cases of so-called projection: the ego, if infatuated, will see its beloved as the most beautiful and sexy person in the world; it will see a hero or heroine as glorious, and an enemy as hatefully evil. But in the case of strangers, such filtering is much less obvious. It is detectable, however, for the average person, in that other empirical people are perceived as distinctly people, as opposed to mere material objects. Those whose oges are not completely closed will perceive

some people as objects rather than as people, on those occasions when there is no filtration because of a hole in the oge. This is Martin Buber's distinction of relating to other people on an I-Thou basis, as opposed to an I-It basis. Perceiving people as objects rather than people is one way in which some people are capable of callousness.

The ego may well intuit (see below) various oge beliefs, and so have its own beliefs about what other people believe, which it will project on to other empirical people. Such projections may or may not coincide with reality, but in either case will influence the ego to the extent that the ego is concerned with what other people, such as the neighbours, think of it.

27: Extremism, Heaven, and Hell

The good and evil poles of the oge are unlike, in that the good is loving and the evil is hating; and they are like in that each is opposed to ego selfishness. In so far as they are unlike, they have different goals and so are in conflict: the sky oge is moral and the underground oge is immoral. The degree of unlikeness between them, and so the degree of conflict between them, varies among individuals; when it is great the individual is an extremist. The main feature of extremism is the steep differentiation between good and evil in both the oge and the ego. Extremists are much more conscious of good and evil, and much more capable of acts of great goodness and great evil, than are moderate people. Their extremism is applied to those areas in which good and evil predominate: religion and politics. Let us look at religion first.

The significance of the fact that the oge lies beyond the ego is that because of this it must also lie beyond every horizon of the moment of the ego's empirical world, since that world is entirely within the ego. So the good pole of the oge is beyond the celestial pole of the empirical blue sky and the evil pole is below the empirical surface of the Earth. These are, of course, the traditional locations of Heaven and Hell, and it is eminently sensible to claim that Heaven is indeed the upper portion of the oge and Hell is the lower portion. More belief shock, especially for atheists and fundamentalists.

If we call the good pole of the oge God, then this God is an agent, the most good, or moral, of all agents; and the next most good agents — oge-people — are angels. He, or possibly She, is a loving but moral God, and so just: good oge people are close to God in His Heaven in accordance with their goodness, and evil oge-people are sent by God down into Hell, by L.A.L.R.U. The evil pole of the oge is the most evil of all agents, Satan, with the closest oge-people being demons. In so far as other people, known by the ego but now deceased, continue to exist in the form of oge-people — as theoretical memories in the oge — so do they in a sense have life after death, in Heaven or Hell, according to their goodness and sinfulness during their lifetimes. Sinfulness in this context is, of course, disobedience of the moral laws of God.

Also, God has some power, being an agent, and so may answer prayers from the ego: specifically, by replacing oge-ego conflict with co-operation. This is most likely to occur when the ego prays for aid in fighting evil and in promoting good — that is, for aiding and abetting the goals of God.

All of this is what might be called Sunday School religion, consisting of the somewhat childish beliefs that are wholly rejected by scientific atheists. Such atheists are usually naive realists and naive realists cannot allow that there is an oge beyond the blue sky and below the surface of the Earth, simply because for them the sky and Earth are real and there is no room, spatially, in scientific astronomy for Heaven and Hell. Since science is overwhelmingly

more credible than Sunday School religion, the latter is utterly rejected. But the Leibniz-Russell theory makes room for the oge without in any way compromising scientific astronomy. Astronomy refers to theoretically real planets, suns, galaxies, etc., which are beyond the theoretical skull, which is beyond the oge, which is beyond the empirical blue sky and visible stars at night. The number of neural connections in the theoretical brain is enormous, so that there is plenty of room for the oge between the ego and the inside surface of the real skull. Thus scientific atheism is naive.

If intuition be defined as the ego gaining knowledge of other parts of the theoretical mind, by L.A.L.R.U., then we can easily understand how some egos may intuit the existence of God and Satan, and Heaven and Hell. Those for whom the oge is both spatially close to the ego and strong will intuit the existence of the oge easily, while those for whom it is spatially far and weak will not. Thus some believe in spite of science, and others do not even though ignorant of science.

However, it does not follow that rejection of atheism must be replaced by Sunday School religion, which seems naive and immature. There is more than one meaning to the word God — meanings as credible in their way as is the oge, and also more significant. We will come to these later, but for now may remark that although the oge, as God, is a person, is moral, just, loving, powerful, and demanding of worship by the ego, and, being beyond the sky, is transcendent to the empirical world of the ego, there are a number of traditional theological attributes that it does not possess. It is not infinite in any way, so it is not all-loving, all-powerful, or all knowing; it is not immanent to the ego's empirical world; it is not in any sense creator of the ego, or soul, or of that ego's empirical world; it is almost wholly irrational, since it is formed by L.A.L.R.U.; it is a tribal God, in that it is not concerned with the good of anyone outside the tribe or nation of the ego; and it cannot be the God with whom the mystics claim that union is possible. Also, it is in no way *one* God: there are as many oges as there are people, and they differ from one another. These differences are usually small among the people of one congregation or creed, larger between different creeds. It is these differences that have produced the schisms present in all major religions — particularly so because the oge represents society hence requires religious observances to be public, and such public meetings can easily expose the differences.

Notice that this congregational character of oge religions is a sufficient condition for the religions being oge based — simply because the oge, as an agent, is essentially social.

28: Politics

Turning next to politics, the second realm of extremism, and also an activity concerned with the oge, we note first that the primary concern of all politicians is hekergy: hekergy in the form of privilege. Politicians have a double concern with privilege, namely, with their own personal privilege, which is ego privilege, and with the privileges of other people, which is oge privilege. There are two attitudes towards oge privilege: those who favour the under-privileged and oppose the over-privileged are radicals, and those who take the opposite stance are reactionaries. In the next chapter but one — Chapter 30 — we will discuss dominance: both ego dominance and oge-dominance, which are relevant here in that reactionaries are ego-dominant and radicals are oge-dominant. This is why politics is so much an oge phenomenon. Thus all politicians lie within a band on a spectrum which stretches between the extremely radical and the extremely reactionary.

There is a sense in which radicals are also reactionaries and reactionaries are also radicals, each in equal proportions. This is because political radicals are technological reactionaries, and political reactionaries are technological radicals. Technological radicals are people who promote technological progress, while technological reactionaries oppose it. Political radicals are people who promote moral progress while political reactionaries oppose it. Political radicals are on the side of under-privileged other people, and want to favour these people, at the expense of the over-privileged, until both groups meet in the middle and all are equal. The exceptions to this equalisation process are the radical politicians themselves, who retain or increase their own privileges. Political reactionaries, on the other hand, favour the privileged, including themselves, at the expense of the under-privileged. To take extreme examples, in a feudal aristocracy the aristocrats make laws which favour themselves at the expense of the peasants and these laws make criminals of their opponents — the archetypical opponent being Robin Hood, who stole from the rich to give to the poor. Another example is a military dictatorship, in which the generals make laws which favour the military at the expense of civilians, and yet another is a democracy in which lobbyists make laws which favour lobbyists. On the other hand, in communist Russia all were equal in terms of education and opportunity, except for the apparatchiks and their children, who had special privileges.

Privilege in this context is wealth, power, or both: hekergy, in other words. Technology comes in here because these days technology is a potent means of increase of wealth and power. So political reactionaries are very much in favour of technology, and provide much research money to science and industry, regardless of the harm that technology may do to the under-privileged, as in slavery, child labour, dangerous mining practices, health-

damaging poisonous processes, and so on. The rise of the industrial revolution saw all of these things: black slaves in the cotton fields, cheap child labour in factories, the use of white-lead in glazing pottery, and reckless coal-mining practices. More recent examples are the mining and installation of asbestos insulation, long after asbestos was known to be carcinogenic, clear-cutting forestry practices, exploitation of cheap foreign labour, reckless pollution, etc. — any radical can provide a long list of examples. Political reactionaries are liable to do these things because they are technological radicals.

Political radicals, on the other hand, are opposed to technology because of the harm it does to the under-privileged: they are technological reactionaries. An extreme technological reactionary is one who wants to "live in the forest, in a log-cabin, and live life as it is meant to be lived," with no technology beyond an axe, to build the cabin, and perhaps a rifle, for meat, and a lot of books, for the long winter evenings, and ... Such people are superstitious towards technology, regarding all of it as polluting, all "chemicals" — i.e. all manufactured chemicals — as either poisonous or carcinogenic, all computers as dangerous, and the like. They are also superstitious towards science, of which they are almost totally ignorant and which they are largely unable to distinguish from technology; for them science is dangerous and evil, with nuclear power being the paradigm.

But what political radicals overlook is that their expensive social programs, designed to help the under-privileged, can only be paid for with the wealth provided by technology. It costs a lot of money to provide everyone with free education, free health-care, and a minimal income, and if a country as a whole does not have the wealth to afford this it is folly to try to provide it, however desirable it might be.

29: Fanaticism and Tragedy

So we may return to extremism, which is large differences between the good and evil poles of both ego and oge. It is extremism in the attitude of the ego to the oge: either to conventional religion, or to politics. At worst it is fanaticism. Fanatics are obsessed with what they see as good and evil, which they see as white or black, without any degrees in between, and they will do anything to promote the one and destroy the other. Depending upon other circumstances, this good and evil may be religious, or political. Usually the destructive side predominates, and allows witch-hunts, and torture and murder, of the supposedly evil. The Holy Inquisition, the Nazi SS, the Communist KGB, the secret police of military dictatorships, all illustrate this. But whether religious or political, such fanaticism is primarily an oge phenomenon. It is a result of L.A.L.R.U., and L.A.L.R.U.-ordered ideas are irrational. The good pole is trying to destroy the evil pole, and claims, rightly, that the evil pole is trying to destroy it. This is not a storm in a teacup, it is a storm in the oge — and thereby projected on to the empirical world, to make in its turn a real political or religious storm. Such storms are generated and perpetuated by fanatics for wholly irrational reasons. The irrational reasons are always a fear of evil, but the nature of the evil depends upon the oge of the person concerned.

It is a matter of common sense that there is evil in the world. Daily news services concentrate upon evil: upon death and disaster. Crime and war — hekergy decreases of people by other people — are endemic to human society. So it is difficult at first to accept that there is no real evil. But common sense is wrong again, all evil is an illusion.

This will be clear once the distinction is made between tragedy and evil. Tragedy is real and widespread, because of the second law of thermodynamics, which requires hekergy decreases at all levels of emergent relations, including the human. Tragedy is any major decrease of human hekergy, such as death and disaster. Evil, on the other hand, is a subjective evaluation of tragedy which is both irrational and false. When a child rapist rapes and murders a young girl, the pain and death of the child are tragic. What is less obvious is that it is also tragic that a man's mind should be so warped that he should have an irresistible, overpowering urge to do this, because he has no other outlet for his overheated and uncontrollable sex drive. But the act and the desire to perform it are only evil in the eyes of the beholder, because of the filtration of the act through the evil pole of the oge.

Needless to say, to revenge a supposedly evil act is equally evil and tragic.

What is even more difficult to accept is that tragedy is only relative to human hekergies, or other living things in a more broad-minded person. The

second law of thermodynamics cannot be denied. It is part of our evolutionary heritage that tragedy must occur. Tragedy is part payment for creativity, birth, growth, and all the other hekergy increases that we obtain in accordance with the principle of conservation of hekergy. In our humanity we have to deplore tragedy, just as we have to revile evil, but from a god's eye view the first is ethnocentric and the second is irrational. Evolution seems to us to be, at worst, pitilessly evil, and at best to be indifferently tragic. Until humanity introduced such practices as cremation and embalming, it was the fate of every living thing to be eaten. Eaten alive by parasites or predators, or eaten after being killed by predators, or eaten after death by scavengers. But the tragedy and evil of this are in the mind of the beholder, even though the hekergy decreases that are death are real. Individuals must die, and in doing so they contribute to the overall good of the biosphere, as food: the hekergy decrease of their death contributes to the overall hekergy increase of the biosphere[19]. And this latter is only part of the flux of hekergy change in the Universe as a whole, according to the principle of conservation of hekergy. Thus we see greater unity within the whole as we progress a little more towards wisdom. In the meantime we must struggle for good and against evil, because that is the way we are made; but, having come this far along the road to wisdom, we have a glimpse of the possibility of release from such irrationality, into a better and more profound value system.

[19] Because of this the moral funerary practice is burial at sea, so as to increase as much as possible the biomass of the ocean — the least that we can do to compensate for all the fishing that we perpetrate.

30: Dominance

In this chapter we continue to examine the concept of the oge in explanation of human irrationality. We shall look at a few more irrationalities and then examine dominance.

When an ego is temporarily victorious in its conflict with the oge, by acting selfishly and immorally, the oge retaliates by inflicting the ego with feelings of shame or guilt: shame for a publicly known act, guilt for a private one. More accurately, shame and guilt are feelings produced in the ego as consciousness of the oge's reaction to the ego's act. Indeed, the experience of shame and guilt may be thought of as empirical evidence of the existence of the oge, since they cannot be explained except by postulating an agent other than the ego: an agent which is both conscious of the ego's action and disapproving of it. If, on the contrary, feelings of shame and guilt were produced by the ego itself, it would be able to will them to cease; and, as most people know only too well, this is not possible.

On the other hand, if the ego is victorious but not immoral — it has won in accordance with rules accepted by the oge — the ego feels triumph. This is why triumph cannot be felt with a victory that is immoral or dishonourable by the standards of the oge, which are not necessarily exactly similar to public consensus.

If a strong oge is oppressing the ego, the ego experiences this as depression, while if a strong ego oppresses the oge, the ego feels this as elation. (Presumably the oge equally experiences elation and depression, for comparable reasons, but we have no evidence of this.) Sometimes these relative strengths swing around, turn and turn about, so that the ego alternates between elation and depression; when this happens the individual is said to have an artistic temperament, and, when extreme, this is manic-depression, also called bipolar disorder.

When there are two agents in conflict, of unequal strength, the stronger will dominate the weaker; so it makes perfect sense to speak of an ego-dominant personality and an oge-dominant personality. An ego-dominant personality will result from an ego stronger than the oge, and the degree of dominance will vary with the degree of strength of the ego relative to the oge — from negligible to overwhelming. And similarly for an oge-dominant personality. We will consider an ego-dominant personality first.

Since an ego-dominant personality has a strong ego and a weak oge, we may expect such a personality to exhibit selfish characteristics and not exhibit moral ones. He or she will be concerned with their own aggrandisement at the expense of others, have little regard for convention and the opinion of other people concerning their actions, have little or no feelings of shame or guilt, not suffer from elation or depression, have little or no honour or moral sense, be

generally callous and ruthless towards other people, and will be good at giving orders but not good at obeying them. Such people are officer material in the armed forces, executive material in business, and upstart aristocrats in a feudal system. And of the two Roman philosophies, stoicism and epicureanism, an ego-dominant person will favour the latter: "Eat, drink, and be merry, for tomorrow we die."

An overwhelmingly ego-dominant personality is a psychopath: someone with no oge at all. Such people have no moral sense and no feelings of honour. They may learn codes for both of these, for prudential reasons — they know that if they publically act immorally or dishonourably they can expect disagreeable social consequences — but these codes have no associated feelings of right and wrong, and their violation produces no guilt or shame. When such people have talent as well as great ambition, they are likely to rise meteorically to power. Names that come immediately to mind are Napoleon, Hitler, and Stalin. When in power, and so beyond retaliation, they are completely callous and ruthless towards their enemies: having no oge, they are without any feelings of humanity. Any talk of a moral sense, or of feeling the closeness of God, is to them as meaningless as is music to the congenitally deaf and painting to the congenitally blind.

Correspondingly, an oge-dominant personality has a strong oge and a weak ego and so will be more moral than selfish. Such people will be dutiful, be conventional, be concerned with what other people think of them, experience shame, guilt, elation and depression, be moral and honourable, be caring towards others, will be better at obeying orders than at giving them, and will be stoical rather than epicurean.

An overwhelmingly oge-dominant personality is a schizophrenic, a person suffering loss of ego. When total, this is catatonia, but in lesser but still serious cases, it is paranoia. Paranoia is characterised by delusions of persecution and of grandeur, and paranoid people are said to have a set of beliefs about the world that is surprisingly logical and consistent, even though quite false. The belief system results from the delusions, and in one sense it is quite true: although false relative to the theoretical world, it is true relative to the oge. An overwhelmingly strong oge is trying to destroy a very weak ego, and the ego projects this fact on to its empirical world, so as to see other empirical people as its persecutors, controlling and ultimately out to kill. And the only defence the weak ego has against the strong oge is bluff, so it tries to convince these empirical people that it is a very strong and important person, whom they should be afraid to persecute. Thus the delusions of persecution and grandeur. If absolutely desperate in this situation the ego will try to kill the empirical people first, in a pre-emptive strike, and so appear to others as a homicidal maniac. Also, loss of ego means an end to the empirical world of

that person, so that those who proclaim that the end of the world is nigh are probably proclaiming their own schizophrenic danger.

Ego-oge imbalances produce an ordering among people that is often called a pecking order. With barnyard chickens any chicken may peck another lower in the order but not peck one higher in the order; one chicken, at the top, is never pecked but may peck any other, and another, at the bottom, is pecked by all and never pecks back. With people this order appears as an order of rudeness ability. To be rude to another person, or to insult them, is also to offend the corresponding oge-person, which is only possible face-to-face if that oge person, and the oge as a whole, are not as strong as the ego. If the oge-person is stronger than the ego then ego-offence may still be possible if the oge-person is safely distanced from the oge; this is why it is easier to be rude on the telephone, and to insult other drivers on the highway as long as eye-contact is not possible.

The pecking order of ego-oge imbalance-order among humans produces hierarchies. There are many examples in history and in present society. Feudal hierarchies, with a monarch at the top, and various ranks of aristocrat down to peasant or serf, were once the only form of government. Such monarchs usually claimed a divine right to rule, and quite rightly so: the oges of everyone held the belief that the strongest should rule, and since the oge is one meaning of the word God, this constituted the divine right of kings. The various church hierarchies, such as pope, cardinals, bishops, priests, and laity in the Roman church; or monarch, archbishops, etc. in the Anglican church, are very similar in their hierarchical structure. So are military organisations, from field-marshals, admirals, or five-star generals, down through the ranks to cannon-fodder. So are bureaucracies: business bureaucracies, from chairman of the board through chief executive officer down through the ranks to night-watchman; and government bureaucracies, from ministers down through mandarins to petty-tyrants to members of the public. Universities often have such a hierarchical structure as well, from president down through the ranks to deans, chairs, professors, and students.

Hierarchies such as these are characteristic of primate societies other than the human, as well. Baboons and chimpanzees, particularly, form tribes ruled by an alpha-male, who is surrounded by lieutenant beta-males, who are surrounded by other males who have no power at all. The alpha-male has exclusive mating rights with all the females, although other males will abuse these rights when they can get away with it. There is also a female dominance hierarchy, parallel to the male one.

Organised crime also takes on a similar structure, with an alpha-male, beta-males and others. The oges of such criminals are such that the rest of

society is part of the oge-enemy, so that it is permissible, even laudable, to plunder and kill therein.

Those individuals who do not have an ego-oge imbalance dislike all hierarchies and try to avoid them. They are libertarians: they believe that all are equal before the law, and so they deny the authority of any one person or group of people, in favour of the majority. Politically they are republicans. Societies become republican, or egalitarian, either through revolution, as did France and the United States, or through slow diminution of the political hierarchy, as in monarchical Britain, Holland, and Scandinavia.

Ego-oge balanced people also reject authority in other fields than the political. The most notable of these is science, which began its meteoric rise during the Renaissance with Copernicus and Galileo, both of whom rejected the authority both of the ancients — Aristotle, Galen, and company — and of the authority of their own contemporary church, in favour of experiment and reason. The same rejection of the authority of tradition took place in the arts. Indeed, the entire Renaissance was such a denial of authority, as was the flowering of ancient Greek civilisation. Both no doubt came about as a result of a large hekergy decrease somewhere else, in accordance with the principle of conservation of hekergy. Each flowering was a burst of creativity, in all fields. The industrial revolution, continuing into the present with the information revolution, is another such flowering: it includes a moral flowering, with abolition of slavery and capital punishment, liberation of women and minorities through repudiation of discrimination, and declarations of human rights.

31: Neurosis

Turning now to a consideration of neurosis, the other area of internal conflict, we note first that the usual analysis of neurosis is by means of the concept of a complex, as in Oedipus complex and inferiority complex. But what is a complex? And what produces it? In the present theory of mind, the answers to these two questions are straightforward. A complex is an agent, and it is produced in early childhood through ego malnutrition.

Just as malnutrition of the body stunts its growth, so does growth of the ego become stunted by malnutrition. The food, as it were, of the ego is love. As we have seen, to love is to give unconditionally, and whatever is given to the loved infant and child is food for the ego. As explained earlier, in the early ego the memories of loving people go to the ego, while the memories of unloving people go to the oge. So if this early ego is to have healthy growth then it must be surrounded by loving people. Later, when both ego and oge are large enough to manufacture their own long-term memories, a stunted ego can grow without love, but such growth will be badly warped. Furthermore, the growth of the oge is conditioned by attitudes of other people, so that an individual's oge has a large good pole, or a large evil pole, depending on the availability of love when young.

So when love is denied, both the ego and the oge become malformed, and the result is neurosis.

Inferiority (of the ego) complexes and superiority (of the ego) complexes are the simplest neuroses to explain: suppose that Mary's father, John, believes that Mary is superior to all her peers, in most or all respects. This belief is a prejudice in John, and as such is introjected into Mary's oge, where it becomes an oge superiority complex.

As already explained, a prejudice is a collection of evidence in favour of a particular belief: evidence attracted to that belief by L.A.L.R.U. Not only do prejudices attract supporting evidence to themselves, they also repel all contrary evidence, also by L.A.L.R.U. All of this contrary evidence forms another prejudice, which is the denial of the original prejudicial belief, and this contrary prejudice has to be repelled from the original prejudice, by L.A.L.R.U. So an ego prejudice generates an equal and opposite oge prejudice, and an oge prejudice generates an equal and opposite ego prejudice.

Furthermore, any prejudice will, if it is large enough, become an agent in its own right, just as oge-people may. Such an agent prejudice is a complex. It is worth pointing out that the usual explanations of neurosis by complexes do not make sense unless the complex is assumed to be conscious of the ego's situation and have some control over it: the explanations do not work unless the complex is an agent. It is also worth pointing out that every agent is, in one sense, a prejudice: the ego is a prejudice, and so is the oge.

So John's prejudice about his daughter Mary's superiority, introjected into Mary's oge, becomes an oge prejudice in Mary. Like any oge prejudice, it generates an equal and opposite ego prejudice in Mary's ego. If these prejudices are large enough they become complexes: an oge-superiority complex and an ego-inferiority complex. The first is an oge belief that Mary's ego is superior and the second is an ego belief that the ego is inferior.

And these prejudices do become large enough to become complexes, because they are associated with withdrawal of love. John's reasons for believing Mary to be superior are selfish reasons, and selfishness excludes love. Selfishness is ego hekergy increase, and love is hekergy increase of the beloved: more of one requires less of the other. John's reasons are selfish because they are based on what John wants Mary to be, and what John wants is selfish to John. For example, John might himself have an ego-inferiority complex, and try to compensate for it by believing Mary to be superior: a belief based on John's needs, not on Mary's needs, and so selfish and unloving.

Having an ego-inferiority complex, Mary will believe herself to be genuinely inferior. She will be modest, unambitious, will constantly have feelings of inadequacy, and be unwilling to undertake tasks which, although well within her capacity, she believes to be beyond her capabilities. Meanwhile her oge-superiority will be projected by her on to other people, whom she will believe to be overrating her and expecting her to undertake tasks well beyond her capacity. Even if these people assess her correctly, this assessment will be higher than her own self-assessment, based as it is on her ego-inferiority complex. So she will constantly feel pressured into what she feels to be over-ambitious undertakings. And when she succeeds, as well she might, she cannot take credit for the success but has to attribute it to luck or outside help, since to take credit would be to reinforce the oge-superiority complex. And when she has children of her own she will want them to be better than she is, according to her false self-assessment, and so produce an oge-superiority complex in them, as her father John did in her.

Equally, of course, oge-superiority complexes may be generated in sons as well as in daughters, and by mothers as well as by fathers.

The opposite situation arises if the parent believes the child to be inferior. If Jane believes her son William to be inferior, for selfish reasons, then William will develop an oge-inferiority complex, and an equal and opposite ego-superiority complex. He will be immodestly vain and arrogant, and believe other people to be constantly underrating him. He will undertake tasks that are beyond his capacity — in part to prove to other people that their assessment of him is false — and fail because he is not good enough to succeed. He might decide to become a great concert pianist, for example, or a research mathematician, even though he does not have sufficient talent for

either. When he fails he will attribute the failure to interference by other people, who, according to his oge-inferiority complex, are trying to prove his inferiority. When he has children of his own he will try to prove his superiority by demonstrating to them their inferiority relative to him: an easy thing to do, since adults are much more able than small children, but a very selfish and unloving thing to do. So his children will also develop oge-inferiority complexes, and consequent ego-superiority complexes.

John and Jane, their children Mary and William, their grandchildren and great-grandchildren, will all be neurotically unhappy people, unless they can cure their complexes. We will examine cure shortly, but first will look at other forms of neurosis.

Second hand ambition is a potent source of neurosis. A father may want his son to take over his business, or to have a higher social status than himself by becoming a doctor or lawyer, or fulfil an ambition which the father had but was not good enough to achieve — such as becoming a sports hero, or world famous, or very rich. The son will have this ambition in his oge, by introjection, and it may well dominate his life. The ambition is unloving, in that it is the father's selfish desire for his son, and in that it takes no account of the son's own ambitions for himself, which are based on his own tastes and talents. If the son is lucky he will be able to rebel successfully; he will greatly hurt his father in this, but to do so is much better than ruining his own life. If he is less successful, he will not rebel successfully and so he will strive to fulfil his father's ambition. If this is relatively simple, like taking over the family business or becoming a lawyer or doctor, he will succeed but be unhappy for all of his career because he is not doing what he really wanted to do. He might, like Gauguin, abandon his wife, children and career in mid-life, in order to paint; or, like Conan Doyle and Somerset Maugham, abandon medicine in order to write. If he is even less successful he will be torn all his life between his father's ambition, lurking in his oge, and his own selfish ambition: he will try to do both and fail at both, because each demands more than half of his effort. Such an unfortunate is a compulsive failure. He keeps on undertaking selfish things, and fails because thwarted by the complex in his oge, and he also keeps on undertaking his father's tasks and fails because thwarted by his selfish ambition. Equally, of course, mothers may impose second hand ambitions, and daughters may be the victims of them.

I once met a Moravian missionary in Labrador whose grandfather had been a Moravian missionary. This grandfather wanted his son to be a missionary also, but his son rebelled. The grandson however was not sufficiently strong to rebel and succumbed to the oge-ambition. When I met him he was stuck far north in Labrador and not at all a happy man. I also recently heard of an engineer who had five sons; he wanted all of them to be

engineers also, but none were. However, all of his grandsons became engineers.

Another form of neurosis is sexual neurosis, immortalised by Freud as Oedipus complex and Electra complex. If one or both parents believe sex to be evil they will be horrified to witness infantile sexuality in their children — particularly sexuality towards the parent. Such horror will remove all love, temporarily, and produce in the children an association of evil with the sexual appetite. Such people will be unable to act sexually with love, since the evil association precludes it. Since healthy sex is essentially loving, these people will be confined to unhealthy sex, evil sex, such as unfeeling affairs, prostitution, or rape . If lucky, the neurosis will be less severe and they will be able to love sexually with someone that their parents considered evil, but whom they themselves do not, such as someone of their own sex. Or they might be able to love someone that their parents did not even consider to be a possible sexual partner, such as someone of another race, or religion, or social class, or caste. As with other neuroses, agents are involved: the ego is either compelled or inhibited, by an agent that constantly monitors the ego's actions and is ready to interfere whenever that agent's interests arise; such interference requires a complex that is both conscious of the ego's situation and able to act within it, and such a complex is an agent.

All these forms of neurosis tend to become perpetuated from parents to children, down through the generations. This is one interpretation of the biblical statement concerning the sins of the father, which are visited upon the child unto the third and fourth generation. As a moral principle this seems to us to be quite unjust: why should children be punished for the sins of their parents? But as a statement of fact it makes sense, because one concept of sin is that sin is anything which impedes progress towards profound truth, and neurosis certainly is such an impediment.

Cure of neurosis is in principle simple, although usually difficult in practice. What is required is an empirical friend who is sympathetic and patient, with whom a dialogue concerning the neurosis is possible. The dialogue, although it takes place between ego and empirical friend, influences the oge by introjection — which is why the friend is essential; in this way it alters the structure of the oge, by changing oge beliefs. The discussion will also alter ego beliefs, if the friend is insightful. Such changes are small, and because they may be painful, like all belief shocks, they can only be made gradually. So when a large amount of change is needed to cure a neurosis, the discussion has to continue intermittently for a long time. Those who do this professionally — psychiatrists, psychoanalysts, psychotherapists, and clinical psychologists — are often called professional friends: they are prepared to listen, for fifty minutes at a time, with patience and sympathy, and to make appropriate

insightful comments. This can be an expensive process, so that group therapy has become a common practice: a group of neurotics meet regularly, for years if necessary, for mutual help in restructuring their oges and egos into more healthy forms.

As an individual matures ego-oge conflict diminishes. The ego is willing to do its duty voluntarily, and the oge is willing to let the ego increase its hekergy legitimately. Such maturation and establishment of peace between ego and oge is necessary for the achievement of wisdom, so cure of neurosis is also necessary for wisdom.

32: Feeling and Thinking

We have already noted in passing that the difference between values and meanings is that values are the hekergies of theoretically real ideas, while meanings are the structures of theoretically real ideas. When the ego is conscious of such hekergies it experiences them as feelings, and when it is conscious of such structures it experiences them as thoughts. Feeling types and thinking types were two of C. G. Jung's classifications of human psychological types (the others being intuiting and sensing, and all four being characterised by introversion or extroversion) because most people emphasise one at the expense of the other. A feeling type, such as a poet or a care-giver, feels strongly and thinks weakly, while a thinking type, such as a logician or mathematician, thinks strongly and feels weakly. There are, of course, degrees of these types, varying on a spectrum between the two extremes of all feeling and no thought at one end, and no feeling and all thought at the other, with a neutral point in the middle at which there are people who are equally good — or equally bad — at both feeling and thinking. Most people occupy a region on this spectrum, rather than a point, and move around that region according to need. And, of course, a person's position on this spectrum has nothing to do with their actual talent for feeling and thinking: the spectrum position only marks their relative strengths in each.

Our main interest at this point is to discover how it is that people can both feel and think so badly. Why, when people feel, do they evaluate hekergies so personally, why are most people's values so subjective? And why, when people think, do they reason so personally, why are most people's beliefs so subjective, so prejudiced, so sophistical? Because unless a person can reduce subjectivity of values, towards absolute values, and reduce subjectivity of belief, towards absolute truth, there is no possibility of wisdom. And, naturally, both these reductions entail belief shock to some degree. Let us look at subjectivity of values first.

Remember that any emergent relation, R, has an absolute value, its hekergy, H_R, which is defined as $H_R = \ln(t/e)$, t being the total umber of ways in which its terms can be arranged and e being the number of those arrangements in which the relation R emerges. Remember also that the force of reaction between two theoretical ideas in the mind is proportional to $(S-½)(H_1H_2)/d^2$, where S is the degree of similarity between the two, H_1 and H_2 are their hekergies, and d is the distance between them. The ego is conscious because a theoretically real idea produces such forces of reaction within the ego; and in this case H_1 is the hekergy of the ego and H_2 is the hekergy of the theoretically real idea which is the cause of the ego's consciousness. So the value that the ego is conscious of is not simply the hekergy H_2, it is this distorted by the hekergy H_1. The absolute value is distorted by the hekergy of the ego. And

since the hekergy of the ego is essentially selfish, the result is a subjective value. As we saw, subjectivity attends to the private, as opposed to objectivity which attend to the public. Pride, vanity, greed, lust, sloth, avarice, and anger — the mainstays of the advertising industry — are all public in the sense of their very common occurrence, but are private in their targets. Not only this but, as we saw, everything the ego becomes conscious of is filtered through the oge, so that evaluations are also distorted by oge attitudes. Both of these are reasons why so much of beauty, truth, and goodness is in the eye of the beholder. The subjectivity is due to the irrationality of the ego and of the oge. Such irrationality diminishes with maturation, as we shall discover, so the distortions of absolute values are greatest in the least mature minds. So to know absolute values requires diminution, and eventually elimination, of the irrationality of the ego and of the oge. Because of this, less mature beholders, having more subjective values, disagree more among themselves; and more mature beholders, having more objective values, agree more among themselves — their evaluations are closer to the absolute values, hence more true, hence more public. For example, in wartime the immature will see the enemy as evil, something to be destroyed, while the more mature will see the war as tragic, something to be stopped, and the wise will see it differently still. (This does not mean that pacifism is a sure sign of maturity, since it may be a prejudice.) A particular form of subjectivity is subjectivity of beliefs: *my* beliefs are particularly valued, among all propositions, because they are *mine*. This book opened with the observation that it is painful to change beliefs: this is so because the loss of a belief is a decrease of ego hekergy, which is what such pain is: a kind of amputation.

Subjectivity of thought is similarly irrational: it is meanings ordered on a basis of L.A.L.R.U., which means that they are primarily prejudicial. The key feature of prejudice, as already explained, is that it automatically and unconsciously selects evidence in its own favour. For example, if someone is prejudiced against penguins, and believes them to be evil, he or she will remember all the bad things they hear about penguins, and forget all the good things; with such memories, these people will find it obvious and self-evident that penguins are bad. Equally, those prejudiced in favour of penguins will find them obviously good. This irrational mental process is easily explained with the principle of like-attracts-like-and-repels-unlike. The evidence that supports a belief is similar to it, or like it, and the evidence against it is dissimilar to it, or unlike it; so all the supporting evidence is attracted to the belief, by L.A.L.R.U., and so memorable by the ego, while all the opposing evidence is repelled and so unavailable to the ego. If you have strong, and seemingly obviously well grounded, dislikes of any class or sect of people, you need only replace penguins in this context with these people to discover that your dislike

is a prejudice. You are likely to react to this discovery with the retort that in your case it is not prejudice because it is *TRUE*; but this also is characteristic of prejudice.

Recall that this book opened with the observation that many beliefs are false, and that philosophy is the attempt to discover and correct them; we now know why so many are false.

Another action of L.A.L.R.U. is to collect theoretical ideas into classes on a basis of their similarity: classes of men, classes of horses, classes of dogs, etc. These ideas collect together into classes because of like-attracts-like. Just as theoretical memories of one's own body go together to form the ego, so do similar ideas of horses go together to form the class of horses, dogs to the class of dogs, and so on. The modern word for *class* is *set*, and set theory is an important part of logic and mathematics, but the word *class* is used here because of its derivative word, *classification*. Classification is also irrational, although it has much utility in animal learning, in the form of generalisation.

Generalisation is the move from knowing something to be true in a few instances to believing it true in all instances. Thus picking up a dog's leash prior to taking it for a walk will quickly teach the dog that this act signals a walk. The dog recognises a pattern of behaviour which is bonded to an expectation: the dog has generalised, which is to say that it has classified all occasions of leash signals as walk signals. People are so prone to generalisation that we have names for its irrational results: superstition and stereotyping. Two very common superstitious actions are to touch wood or to cross fingers to avert bad luck. Again, almost all inexperienced tourists in foreign countries behave badly: they are nervous because of the unfamiliar culture and surroundings, and react by behaving ultra-nationalistically in compensation, so that they become loud, arrogant and uncouth. The local people are then very likely to form unfavourable stereotypes of these nationalities, which are quite untrue when they are back in their home countries.

It is because of this irrationality that classification is not a good way of formulating laws in science: classification is usually by means of qualitative data, and, as we saw, qualitative data are valued less than quantitative data in science. Qualitative data are empirical concrete qualities, which are secondary qualities, which are illusory — although essential if we are to perceive empirical relations — while quantitative data are empirical relations which, if potentially universally public, are true images of real relations.

Even more important in science is the fact that scientists generalise. They argue from a formula that describes a few particular cases — those already known empirically — to all cases: and the statement that this formula is true of all cases is called a scientific law. Philosophers of science who are naive realists find the explanation of this fact to be the most difficult problem

in all of philosophy of science: how can scientific generalisation be justified when superstitious and stereotypical thinking are obviously so similar to scientific generalisation and yet so unreliable? The problem, as we have seen, is the problem of induction, and the solution is that scientists rely on publicity: the formula must be completely public: in its proper context it must always work. Superstition and stereotyping are not public in this way: lighting three cigarettes from one match is not always unlucky, and obnoxious tourists are not that obnoxious when they get home again.

But if L.A.L.R.U. ordering of ideas is irrationality, what is rationality? The answer is simple. Rationality is characterised by logical necessity and maximum hekergy. As we saw in connection with the best of all possible worlds, adding necessary ideas or removing contingent ideas from a system of ideas increases the hekergy of that system, while adding contingent ideas or removing necessary ideas reduces its hekergy. So a system of ideas which is wholly rational — everything is necessitated by a few primitive ideas — has maximum hekergy. And the greater the number of ideas in it, the greater that maximum is — which is why unification of ideas from different fields is so important.

With this we can anticipate the definition of wisdom: it is ultimate rationality, or maximum hekergy of mind. Some of what wisdom requires, obviously, is elimination of all irrationality. Because this means the elimination of all subjectivity and prejudices, it also means the elimination of the ego itself — a belief shock that lays fair to boggle not only sophists, but seekers after wisdom as well. But on the other hand, if wisdom is maximum hekergy of mind then it is, without any possible exception, the most valuable state a mind can ever achieve: because hekergy is absolute value.

The ego is able to shift its attention to what interests it most, by L.A.L.R.U., and so it can shift its attention so as to rearrange theoretical ideas into structures of higher hekergy. It does so because of the mind-hekergy principle: it needs to increase its own hekergy, and by rearranging its ideas so as to produce emergent relations out of them, it does so. In particular, by obtaining the arrangement of maximum hekergy, it is arranging the ideas with emergents of singular possibility, which are relations of logical necessity. The ideas are then rationally ordered, instead of ordered by L.A.L.R.U. And they are part of the ego: the ego may say of them “My ideas on this are ...” or “What I think about that is ...”

The ego does not necessarily succeed in this completely. It may obtain only a partial rationality, within a particular context, with some of the ideas in that context ordered rationally and some ordered by L.A.L.R.U. But the ego will still do this because such a mixed ordering has a higher hekergy than a purely L.A.L.R.U. ordering, and the ego must increase hekergy if it can.

One such partially rational ordering is sophistry: an irrational belief is bolstered by an argument that is as rational as the ego can make it. We have had many examples of sophistry. We can now see why sophistry is so common: not only does it preserve a cherished but false belief, but it has the value of some rationality. However, just as two half-wits do not make a wit, so do two sophistries not make a rationality.

Another partially rational ordering of ideas is rationalisation of irrational acts: the ego justifies its irrationality, to the oge, by inventing a rational, but false, explanation which puts the ego in a much more meritorious light. For example, a very common irrationality is malice: the ego acts in a mildly evil way towards someone else in order to get an illusion of ego hekergy increase. This illusion arises because reducing the hekergy of the oge, relative to that of the ego, makes the ego hekergy seem to increase. In just the same way, a tall man on his knees before a short despot makes the despot feel tall. So may a malicious woman tell her friend what nasty things other people are saying about her: “You know that I never ever gossip, dear, but I must tell you, for your own good, what people are saying about you ...” The malice is thus rationalised into an act of goodness. Vandalism is material malice, common among the material have-nots, and usually rationalised as a practical joke. Other rationalisations try to improve the appearance of acts of stupidity, mistakes, selfishness, immorality, and other irrationalities. We all of us do it, and usually deceive only ourselves — because on these matters we selfishly need to be deceived, while other people do not need to deceive themselves about our irrationalities.

33: Mathematics and Music

Needless to say, not all rational thinking is sophistry or rationalisation. So we need to think about thought. This will be the subject matter of the next three chapters. For now we will take an easy climb in our roller coaster of ideas, a pause for rest and refreshment, in order to examine a particular case of unity between disparate fields of human activity: mathematics and music. The unity of these two lies in their structure and beauty. Those who suffered from incompetent teachers of mathematics and who consequently have subjective feelings of antipathy towards mathematics may wish to skip this chapter.

We are going to introduce some elementary mathematics, in as gentle a way as possible, and put it all together into a musical structure. It will not be necessary to have a complete grasp of the mathematical ideas — to get that requires the sort of drill with problems and exercises that a pianist or a violinist goes through in order to become tolerable to others — it will be enough to have some understanding of, and sympathy for, the ideas. One other thing: mathematics is not the symbolic expressions that it is written in, it is the meanings of these expressions: the meanings of mathematical expressions, which are relations, have as much similarity to the expressions themselves as does music to its score: it is meanings and music that we concerned with, not symbolic expressions and scores.

We need five bits of mathematics: the concept of the base of a logarithm, infinite series, differentiation, a little bit of trigonometry, and complex numbers. We will look at each in turn, and then put them together.

We have already met logarithms, in the definition of hekergy. Logarithms relate multiplication to addition, or, in other words, products to sums: the logarithm of the product of two numbers is the sum of their logarithms. Logarithms do this through what are called the powers of numbers. In expressions such as $2^2 = 4$, $2^3 = 8$, $2^4 = 16$, $2^5 = 32$, and $2^6 = 64$, the indices 2, 3, 4, etc. represent the power of 2 in each expression. $2^2 = 2\times2= 4$, $2^3 = 2\times2\times2 = 8$, $2^4 = 2\times2\times2\times2 = 16$, and so on: the index tells us the power, which is the number of instances of 2 in each multiplication. (As an aside, multiplication is defined in an analogous way, with addition: $2\times4 = 2+2+2+2$ — four instances of two, added together.) It is characteristic of powers of numbers that multiplication of powers of numbers equals the addition of their powers. For example, $2^2\times2^3 = 4\times8 = 32$; but $32 = 2^5$, so we have $2^2\times2^3 = 2^5$. The significance of this is that if we take the indices of this last expression, we have $2+3 = 5$. What we have is $2^2\times2^3 = 2^{2+3}$: the left hand side of this equation is a multiplication and the right hand side is an addition. In general, if we take a number, any number, n, say, and any two powers of n, say a and b, then it is true that $n^a\times n^b = n^{a+b}$. Thus we have our relation between multiplication and addition. Since $2^2 = 4$, and $2^3 = 8$, we say that 2 is the logarithm of 4, and 3 is

the logarithm of 8; then if we add these logarithms, 2+3, we get 5; and the number whose logarithm is 5 is 4×8, or 32 — that is, 2^5. Because we have used 2 as the base of our powers, we say that these logarithms are to base 2; they are written as $\log_2 4 = 2$ and $\log_2 8 = 3$. In our example using n, we would say that our logarithms are to base n: if $n^a = p$ and $n^b = q$ then $\log_n(p \times q) = (\log_n p + \log_n q) = (a+b)$.

Since division is the reverse of multiplication, and subtraction is the reverse of addition, division can be done by subtraction of logarithms.

There is a complication, however. We see that $\log_2 4 = 2$ and $\log_2 8 = 3$, but what is, say, $\log_2 5$? That is, if $5 = 2^x$, what is x? Obviously, x must be some number between 2 and 3, and so we have to have fractional indices. But fractional indices are not difficult to interpret. Consider $2^{½}$, for example: $2^{½} \times 2^{½} = 2^{½+½} = 2^1 = 2$, since any number n raised to the power one is unchanged[20]; but if $2^{½} \times 2^{½} = 2$ then the only possible meaning for $2^{½}$ is that it is $\sqrt{2}$. We can interpret negative symbols in the same way. $2^3 \times 2^{-2} = 2^{3-2} = 2^1 = 2$, so that 2^{-2} must be $1/(2^{+2})$. So in general, for any numbers n and m, $n^{1/m}$ is the m^{th} root of n and n^{-m} is $1/n^m$. Calculating the fractional indices for all useful numbers used to be a difficult task, but it was done; the results, put together, constitute logarithm tables. These days logarithms are easily calculated with computers and electronic calculators.

Logarithms were invented by a Scotsman named John Napier, who published a set of logarithm tables, in 1614, which had as comparable an effect on Napier's contemporaries as modern calculators have had in our day. Suddenly the enormously tedious multiplications and divisions that mathematicians encountered in such things as astronomy and navigation, became much easier. Napier's logarithms are called natural logarithms because he used a number for his base called e. A natural logarithm is symbolised by ln, rather than log. Not only does e introduce our second topic: infinite series, but once we know what such a series is we can understand how e is used to calculate logarithms.

A series in mathematics is a series of numbers which are added together. An infinite series is an unending series. The interesting thing about some infinite series is that, although they have an infinity of terms, their sum is finite. Consider, for example, the series ½ + 1/4 + 1/8 + 1/16 + ..., in which the n^{th} term is $1/2^n$. If you start adding the terms, one by one, the successive sums that you get are always each larger than the previous one, but the increases get smaller and smaller. The successive sums get closer and closer to 1, but never quite reach it. Such an infinite series is called a convergent series, because its

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[20]We have to say that $n^1 = n$ since $n^1 \times n^1 = n^{1+1} = n^2 = n \times n$, hence $n^1 \times n^1 = n \times n$ and $n^1 = n$. Similarly, $n^0 = 1$ because $n^1 \times n^0 = n^{1+0} = n^1 = n = n \times 1$.

successive sums converge towards some number — 1 in this example — without ever reaching it. This number towards which it converges is called its limit. Most infinite series do not converge, and so do not have a limit; they are called divergent series, and their sums are infinite. For example, the series 1 + 1 + 1 + ... is divergent. Napier's number *e*, called exponential *e*, is defined by a convergent infinite series: e = 1 + 1/2! + 1/3! + 1/4! + ..., where the n^{th} term is 1/*n*! We have seen the symbol ! before, in connection with permutations: it stands for 'factorial' and 4!, or 'four factorial', is 4 × 3 × 2 × 1, while *n*-factorial or *n*! = *n* × (*n*−1) × (*n*−2) × ... 3 ×2 × 1. The value of *e* in calculating logarithms is the fact that *e* raised to any power *x* is also a series, namely: e^x = $1 + x + x^2/2! + x^3/3! + x^4/4! + ... x^n/n! + ...$ and this series is also convergent. Note that $x^1/1!$ is *x*, since x^1 is *x* and 1! is 1; and since 0! and x^0 are both defined as 1, the first term in the series is $x^0/0! = 1$; also, if *x* = 1 we have $e^1 = e$, which is our original series. So if you want the natural logarithm of 5, say, you calculate it from $5 + 5^2/2! + 5^3/3! + ...$ — the more terms you include in your calculation the more accurate your logarithm. The number e^x has another interesting property, which is explained by means of our third topic, differentiation.

Differentiation is one half of the calculus, invented by Newton and, independently, a little later, by Leibniz — the same Leibniz of the Leibniz-Russell theory, and who said that this is the best of all possible worlds. Most non-mathematicians have heard of the calculus, and believe it to be the last and most difficult part of mathematics. In fact, it is not difficult, and for most mathematicians it is almost the first part of mathematics.

If you have two variable quantities related together by some formula, then if you differentiate that formula you get the rate at which the first varies with respect to the second; this rate is called the derivative of the first with respect to the second. For example, if you drop a cannon ball off the top of the Leaning Tower of Pisa, and discover that the distance it has fallen for each second is described by the formula $d = kt^2$, where *d* and *t* are distance and time of falling, and *k* is a constant number, then if you differentiate this formula you get a new formula which relates the velocity, *v*, of the cannon ball to time: $v = 2kt$; and if you differentiate this new formula, you get a third which relates its acceleration, *a*, to time: $a = 2k$. We say that velocity is the derivative of distance with time, and acceleration is the derivative of velocity with time. If you did your experiment carefully you would find that the acceleration was constant all the way down: namely, 2*k*.

Here we do not have to worry with the details of differentiation — of how derivatives are calculated — we only need to know two formulas. One is that the derivative of a constant is zero (because if it is constant it does not have any rate of change), and the other is the formula that the derivative of x^n is

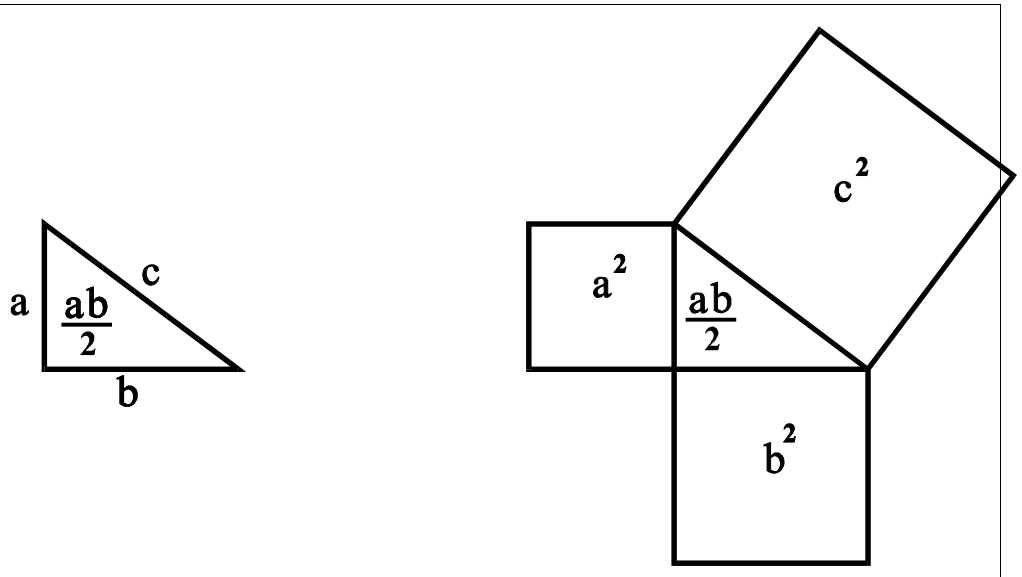

Fig. 33.1. Note that the area of a rectangle having sides a and b is ab, so the area of the right triangle is half this: ab/2.

nx^{n-1}. For example, the derivative of any constant is zero, so the derivative of 1 or 2 or any other number is zero, since all numbers are constants. And the derivative of x^5 is $5x^4$, that of x^4 is $4x^3$, that of x^3 is $3x^2$, that of x^2 is $2x$, and that of x is 1. (This last because $x = x^1$ and $1 \times x^{1-1} = x^0 = 1$.) We need these two things because we want to consider the possibility of differentiating an infinite series, such as that of e^x, term by term. So let us consider each term of the exponential series, e^x, and differentiate it.

We have: $e^x = 1 + x + x^2/2! + x^3/3! + x^4/4! + ...x^n/n! + ...$, so

The first term of e^x is 1, whose derivative is 0.

The second term of e^x is x, whose derivative is 1.

The third term of e^x is $x^2/2!$, whose derivative is $2x/2! = x$

The fourth term of e^x is $x^3/3!$, whose derivative is $3x^2/3! = x^2/2!$

The fifth term of e^x is $x^4/4!$, whose derivative is $4x^3/4! = x^3/3!$

And the $(n+1)^{th}$ term of e^x is $x^n/n!$, whose derivative is $nx^{n-1}/n! = x^{n-1}/(n-1)!$

If you add these together you find that the derivative of e^x is e^x: a neat little surprise.

(For those who are interested, another use of differentiation is that it provides the slope of a tangent to a curve. If you plot $y = x^5$, say, as a graph and take any point on the curve, say (p, p^5) then the slope of the curve at that point

is the derivative, $4x^4$, with x replaced by its value at that point: $4p^4$. But we do not need this here.)

Trigonometry is another branch of mathematics which most non-mathematicians have vaguely heard of, and believe to be horrendously difficult. But it is in fact nothing of the kind. It deals with right-angled triangles, and most people remember right-angled triangles from their school geometry in connection with Pythagoras' famous theorem — although they have forgotten the theorem. A right angled triangle is any triangle which has one of its angles a right angle: an angle of 90°. The side of the triangle opposite the right angle is called the hypotenuse, and Pythagoras' theorem says that for every right angled triangle the area of the square on the hypotenuse is equal to the sum of areas of the squares on the other two sides, as in Fig. 33.1: $a^2 + b^2 = c^2$. So if we have a triangle and we know that its sides are 3, 4, and 5 units of length, then we know that since $3^2+4^2 = 5^2$, because 9 + 16 = 25, the triangle must be right angled — and, indeed, carpenters and builders have long used these three figures to obtain a right angle. There is a proof of Pythagoras' theorem which is so simple and elegant that I offer it here just as an illustration of mathematical beauty: see Fig 33.2.

Trigonometry consists of defining the ratios of the lengths of the sides of a right angled triangle, for any angle a, where a is the angle opposite the side a in Fig. 33.1. We are only concerned with two of these definitions: the ratio a/c is called sin a (pronounced "sign a" and short for 'sine a') and the ratio b/c is called cos a (pronounced "cos a" and short for 'cosine a'). Trigonometry is concerned with relations between such defined ratios. For example, for any angle a, $(\sin a)^2 + (\cos a)^2 = 1$. This is easy to prove, since $(\sin a)^2 = a^2/c^2$ and $(\cos a)^2 = b^2/c^2$, so the sum of these is $a^2/c^2 + b^2/c^2 = (a^2+b^2)/c^2 = c^2/c^2 = 1$,

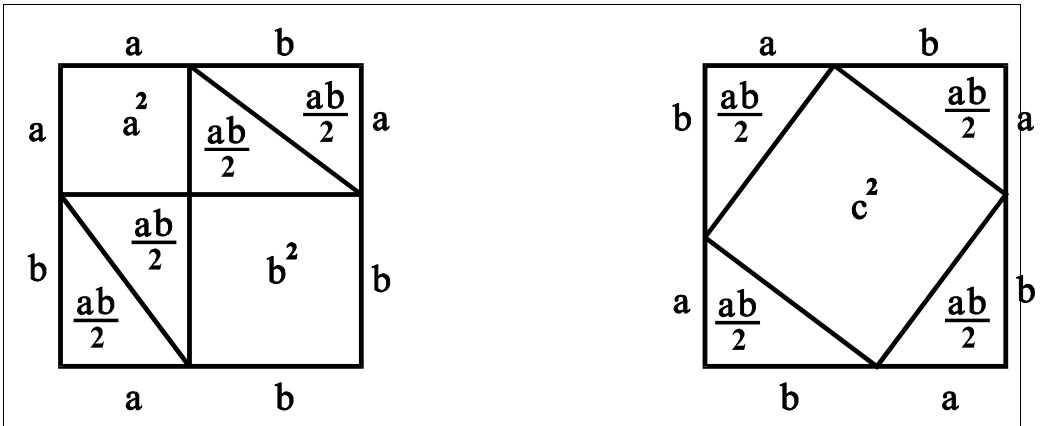

Fig. 33.2.

since $a^2+b^2 = c^2$ by Pythagoras' theorem. Four particular values of sin and cos are: $\sin 0° = 0$, $\cos 0° = 1$, $\sin 90° = 1$, and $\cos 90° = 0$; these can be verified by imagining the angle a in Fig. 33.1 to be either $0°$ or $90°$. We will also need the values $\sin 180° = 0$ and $\cos 180° = -1$, and the fact that $\sin(-a) = -\sin a$.

However, an important point in trig is that angles are not usually measured in degrees, where a right angle is $90°$, and a full circle is $360°$: these are arbitrary units, invented by the ancient Babylonians. Instead mathematicians use natural units of angle called radians, where one radian is defined as the angle within a circle such that the length of the arc of the circle that angle cuts is equal to the radius of the circle. Since the ratio of the circumference of a circle to its diameter is the famous number π (the Greek letter pronounced *pi*), which is approximately equal to 22/7, it follows that the ratio of the circumference to the radius is 2π — since the radius is half the diameter. So $360°$ equals 2π radians, $180°$ is π radians and a right angle, $90°$, is $\pi/2$ radians. So we can write $\sin \pi/2 = 1$ and $\cos \pi/2 = 0$, and $\sin \pi = 0$ and $\cos \pi = -1$.

One other point about sin and cos: the derivative of $\sin x$, with respect to x, is $\cos x$, and the derivative of $\cos x$ is $-\sin x$.

Complex numbers, our fifth and last preliminary, are in a sense double numbers: they consist of two parts, called real and imaginary. The real part is a real number, and the imaginary part is a real number multiplied by i, where i is the square root of minus one, $\sqrt{-1}$. The symbol i stands for 'imaginary', and imaginary numbers were originally so called because mathematicians believed them to be impossible. This is because any real number squared is equal to its negative squared; for example, $5^2 = (-5)^2 = 25$. So if $\sqrt{(25)} = \pm 5$ (that is, plus or minus 5), what does $\sqrt{(-25)}$ equal? There seems to be no answer. But if $i = \sqrt{(-1)}$ is allowed to exist then $\sqrt{(-25)} = \sqrt{(-1)} \times \sqrt{(25)} = i\sqrt{(25)} = \pm i5$. Complex numbers, such as $(a + ib)$, turn out to be really very useful in mathematics, but all that we really need to know about them here is that $i^2 = -1$; however it is unsatisfactory to be given a mysterious entity such as i without more clarification, so we will explain it with the concept of an *operator*. An operator in mathematics is anything which changes something. For example, "×3" may be thought as an operator which changes any number n to $n\times 3$. In the same way "$\times(-1)$", or "times minus 1" is an operator: it changes any number n to its negative, $-n$. As is well known, the positive and negative numbers may be represented on a straight line, as in Fig. 33.3. To add n to a number on such a line is to move it by n units to the right, and to subtract n from it is to move it n units to the left. For example, to subtract 3 from 2 is to start at +2 and move 3 to the left, to get −1 — and as we know, $2-3 = -1$. But we can also get −1 by multiplying +1 by −1, just as we can get −2 by multiplying +2 by −1, −3 by multiplying +3 by −1, and so on. So we can think

of $\times(-1)$ as an operator which swings a positive number through 180°, or π radians, changing it to the corresponding negative number, as in Fig. 33.4. Notice that if we multiply by -1 twice — that is, by $(\times(-1))^2$ — we swing a number through 180° twice, which is 360° (or 2π radians) and this leaves the

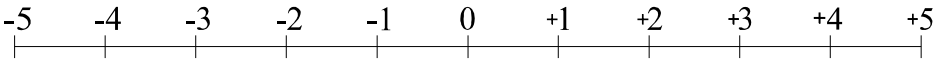

Fig. 33.3

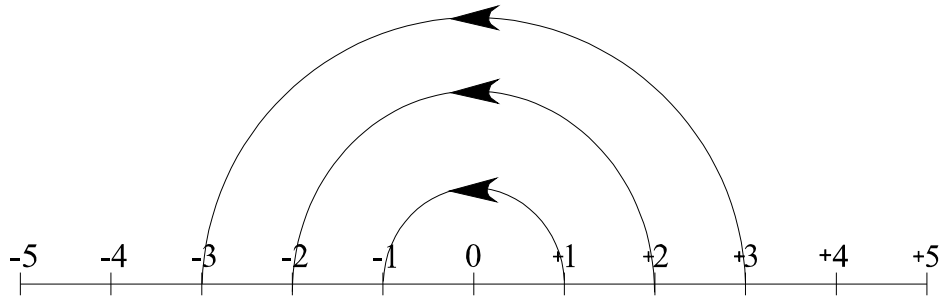

Fig. 33.4

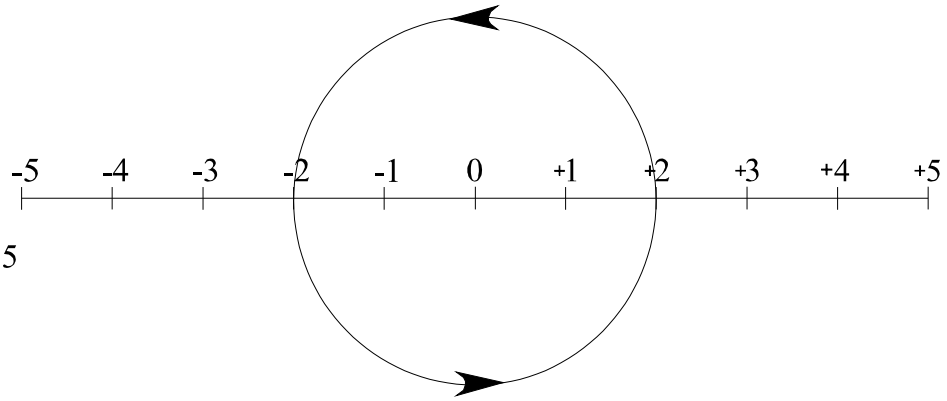

Fig. 33.5

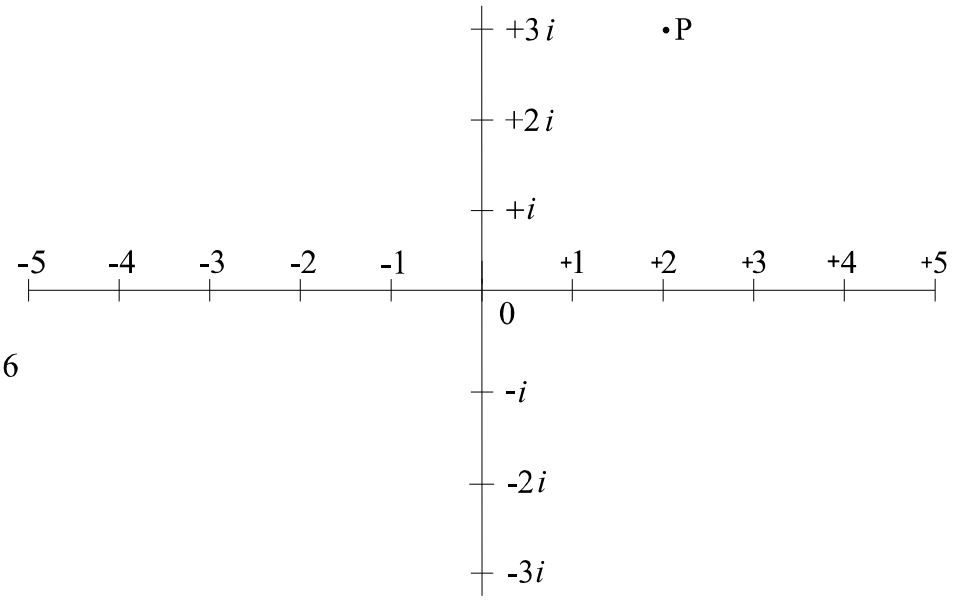

Fig. 33.6

number unchanged, as in Fig. 33.5. This explains the often dogmatically stated (and therefore puzzling) principle that "minus times a minus is a plus." We can now define an operator, i, which swings a number through 90°, or $\pi/2$ radians, and this gives us a new number line, as in Fig. 33.6. It is called the imaginary line and, together with our original number line, it defines a plane; any point in the plane is a combination of two numbers, one real and one imaginary, as the point P in Fig. 33.6 is $2+3i$. This is enough to explain what the operator i is; because if we multiply a number by i twice, we swing that number through two right angles, twice 90°, or 180°, which is to say that the operator i performed twice is the same as performing the operator $\times(-1)$ once; but to multiply by i twice is to multiply by i^2, so $i^2 = -1$, in which case $i = \sqrt{-1}$.

By way of introduction to our relating of mathematics to music, I should explain that many years ago I was a member of an expedition to the Antarctic. During the long winter, when there was not much to do, I was thinking about a particularly beautiful formula in mathematics, which I had learned while an engineering student, and wondering if I could prove it. I spent some time on it, and eventually came up with a proof, which I then took to my friend Steve Ward, also wintering there. Steve was as keen on chamber music as I was on mathematics, and he and I had many discussions on both subjects. My proof was, I thought, very like a piece of music, and after much discussion Steve and I decided that it most resembled an andante and fugue. So here is our andante and fugue.

The first movement begins with the statement of a theme: can the trigonometric function, sin a, be represented by an infinite series? Let us suppose that it can.

Suppose that:

$$\sin a = A + Ba + Ca^2 + Da^3 + Ea^4 + Fa^5 + ... + Na^n + ...$$

where A, B, C, ...N, ... are unknown numbers and a is an angle expressed in radians. If we put $a = 0$ in this series, then we have $A = 0$, since $\sin 0 = 0$ and all the terms on the right hand side except A are zero because multiplied by a.

Now differentiate the series, term by term:

$$\cos a = 0 + B + 2Ca + 3Da^2 + 4Ea^3 + 5Fa^4 + ... + nNa^{n-1} + ...$$

and put $a = 0$ again; then we have $B = 1$, since $\cos 0 = 1$.

Differentiate again:

$$-\sin a = 2C + 3\times2Da + 4\times3Ea^2 + 5\times4Fa^3 + ... + n(n-1)Na^{n-2} + ...$$

and put $a = 0$ again; then we have $C = 0$, since $\sin 0 = 0$.

Differentiate again:

$$-\cos a = 3\times2D + 4\times3\times2Ea + 5\times4\times3Fa^2 + ... + n(n-1)(n-2)Na^{n-3} + ...$$

and put $a = 0$ to get $D = -1/(3\times2\times1) = -1/3!$, since $-\cos 0 = -1$.

Repeating this process we get $E = 0$, $F = 1/(5\times4\times3\times2\times1) = 1/5!$, and in general $N = 0$ if n is an even number, while if n is odd then $N = -1/n!$ if $(n+1)$

is divisible by 4 (without remainder) and N = +1/n! if not. So we have the infinite series:

$$\sin a = a - a^3/3! + a^5/5! - a^7/7! + a^9/9! - a^{11}/11! + ...$$

We next repeat our theme with a variation: can cos a be represented as an infinite series? We suppose that it can, and assume that:

$$\cos a = A + Ba + Ca^2 + Da^3 + Ea^4 + Fa^5 + ... + Na^n + ...$$

(assume that the A,B,C,... here are different numbers from those of sin a.) Repeated differentiating and putting $a = 0$ gives us N = 0 if n is an odd number, while if n is even then N = +1/n! if n is divisible by 4, and N = −1/n! if not. So we have the infinite series:

$$\cos a = 1 - a^2/2! + a^4/4! - a^6/6! + a^8/8! - a^{10}/10! + ...$$

Then we combine the two themes, with a variation, into a fugue. Instead of a in our two themes, we have ia, where i is $\sqrt{-1}$. Then we have $(ia)^1 = ia$, $(ia)^2 = -a^2$, $(ia)^3 = -ia^3$, $(ia)^4 = +a^4$, $(ia)^5 = ia^5$, and so on. This gives us:

$$\sin ia = ia + ia^3/3! + ia^5/5! + ia^7/7! + ia^9/9! + ia^{11}/11! + ...$$
$$= i(a + a^3/3! + a^5/5! + a^7/7! + a^9/9! + a^{11}/11! + ...)$$

and:

$$\cos ia = 1 + a^2/2! + a^4/4! + a^6/6! + a^8/8! + a^{10}/10! + ...$$

This should be looking very familiar. Suppose we multiply sin ia by $-i$ and add it to cos a. First we get:

$$-i\sin ia = -i^2(a + a^3/3! + a^5/5! + a^7/7! + a^9/9! + a^{11}/11! + ...)$$
$$= (a + a^3/3! + a^5/5! + a^7/7! + a^9/9! + a^{11}/11! + ...)$$

since $-i^2 = +1$; adding cos ia to this gives us:

$$\cos ia - i\sin ia = 1 + a + a^2/2! + a^3/3! + a^4/4! + a^5/5! + a^6/6! + ...$$

But the right hand side of this equation is a familiar series: it is e^a. What an extraordinary result: two trig functions are related to the basis of natural logarithms by the square root of minus one. But this is not all. What happens if we extend our fugue and examine e^{ia} instead of e^a ? We write ia in place of a in the last equation and get:

$$e^{ia} = \cos i^2a - i\sin i^2a = \cos a - i\sin(-a) = \cos a + i\sin a$$

and this in turn brings us to the beautiful coda of our andante and fugue, for when we replace a with π, the ratio of the circumference of a circle to its diameter, since sin π = 0 and cos π = −1, we get:

$$e^{i\pi} = \cos \pi - i\sin \pi = -1.$$

A wonderful result: $e^{i\pi} = -1$. Three very unusual numbers, e, i, and π are related in this way to minus one. Now you see what mathematics and music have in common: it is two things, beautiful structure and necessity. We value the structure in both because of its high hekergy, due to both mathematical necessity and musical necessity, which have maximum hekergy. What a lovely union of thought and feeling!

34: The Problem of Universals

So far in our theory of mind we have mostly been dealing with the irrational: all arrangements of theoretical ideas which are ordered by L.A.L.R.U. Thus the ego and the oge are irrational, as are oge-people, prejudices, classification, and neurotic complexes. We now turn to the rational features of mind. We are concerned primarily with rational thought to start with, and will come to rational feeling later.

We must first pin down what thought is: thought is concerned with abstract meanings, as opposed to imagination, which is concerned with concrete meanings: concrete images.

The history of what meanings are is one of great muddle, as is shown by that very old philosophical problem, the problem of universals. A universal is a word that has plural reference, as opposed to a proper name or a definite description, which has only one reference. For example, *Bertrand Russell* is a proper name and refers to only one person, while the word *person* refers to anyone, so has a plural reference and is a universal; equally, *the highest mountain on Earth* is a definite description, with only one reference, while the word *mountain* has a plural reference and is a universal. The problem of universals is the problem of discovering what kind of meaning universals have. This problem was endlessly debated by medieval philosophers, who had three possible solutions to the problem, upon which they could not agree.

One of these, the simplest, is called nominalism, and those who advocate it are called nominalists. Nominalism originally was the view that universals are their own meanings: the word itself is the meaning. This view is epitomised with statements such as "All thought is silent speech," "Words are the counters of the mind," and "There is no thought without language." Nominalism has the difficulty that it cannot explain synonyms, and it cannot explain similar thoughts in different languages. If the meanings of 'heavy' and 'weighty' are these words themselves, then they are quite clearly two quite different meanings. And if the meanings of 'It is raining' and 'Il pleut' are the sentences themselves then quite clearly these two sentences have very different meanings. These problems were apparently solved during the twentieth century by the very influential philosopher Ludwig Wittgenstein (1889-1951), who said that language is like games, which have rules, and the meanings are to be found in the rules of the language game. So he introduced the idea that philosophy should consist of analysis of the language game in which philosophical problems are stated; he claimed that this would, for each problem, either solve the problem or else show it to be pseudo-problem. The resulting philosophical movement, called linguistic analysis, vigorously pursued this program for several decades, but did not have much success. So we have to conclude that linguistic analysis, and nominalism, are not a solution to the problem of

universals. We shall in fact discover that nominalism is a partial solution, but no more, so that to declare it a total solution is an error of over-simplification.

The second possible answer to the problem of universals was called conceptualism by medieval philosophers. A concept was supposed to be a combination of a word and an abstract idea, such that the abstract idea is the meaning of the word. It is abstract ideas that nominalists are primarily concerned to deny, often passionately so. They usually claim that since there is no empirical evidence for abstract ideas — that is, they cannot discover them introspectively — therefore they do not exist. Whereas conceptualists are sure that they themselves can discover abstract ideas introspectively, so they know that these things exist. Perhaps nominalists have very vivid imaginations and can no more discover abstract ideas than we can see stars in sunlight, while conceptualists have weak imaginations and so can discover abstract ideas introspectively. Or, at least, if conceptualists cannot actually discover abstract ideas introspectively, they are very conscious of the meanings of various universals, quite distinctly from the words, and so postulate abstract ideas as an explanation of these meanings. Thus it may be that the difference between conceptualists and nominalists is like the difference between musicians and tone deaf people, or between painters and colour blind people. The weakness of conceptualism is that conceptualists have never been able to say what an abstract idea actually is, other than being an idea which is not concrete — where the concrete is any sensation, any secondary quality. This means that conceptualism does no more than replace one set of words, *meaning of a universal*, with another, *abstract idea*: hardly a solution to the problem.

The third possible answer to the problem of universals is now called Platonism, because it is based on a misunderstanding of Plato's theory of forms. Platonism is the view that there must be objects to which abstract ideas refer. An idea is always an idea *of* something, so the abstract idea of, say, the number two must be an idea of the number two itself. Particularly so because there are many abstract ideas of the number two — at least one for every person who can count — so there must be one number two of which all these abstract ideas are ideas. The advantage of this answer to the problem is that it explains necessity in logic and mathematics: if *the* number two has certain properties, then every abstract idea of it will also have those properties. Thus every abstract idea of two will necessarily imply that two is both an even number and a prime number, and that two is the only number for which the formula $n+n = n\times n = n^n$ is true.

A fourth possible answer to the problem of universals was proposed by the profound Dutch philosopher Spinoza (1632-77), following the lead of Descartes (1596-1650). Spinoza said that there are two kinds of universal: adequate ideas and inadequate ideas, distinguished by being clear and distinct,

on the one hand, and confused images on the other. A confused image is many more or less similar concrete ideas in the imagination, blurred together. Spinoza gave the examples of man, horse, and dog. A clear and distinct idea is an abstract idea: Spinoza gave mathematical ideas as examples. It is quite surprising that very few philosophers have followed Spinoza's lead of allowing more than one solution to the problem; most philosophers are passionately wedded to just one solution, and claim that all universals, without exception, have that kind of meaning.

A fifth possible answer developed in the twentieth century, with a movement called the logistic program, which tried to derive all of mathematics from logic; the two most important figures in this were Whitehead (1861-1947) and Russell, with their *Principia Mathematica*. (This was the same Russell of the Leibniz-Russell theory.) In this program they used the idea that the meaning of a universal is the entire class of things to which that word applies. So the meaning of *man* is the class of all men, the meaning of *horse* is the class of all horses, and the meaning of *dog* is the class of all dogs. As already mentioned, the modern name for class is set. Two features of a set are called its extension and its intension: the extension being all of its members, and the intension, if the set has one, being what all and only its members have in common. So the fifth answer to the problem of universals may be called extensionalism, which is the view that the meaning of a word is the extension of that word, the extension of the set of all of the individuals to which that word applies. Whitehead and Russell favoured extensions over intensions because not every set has an intension.

Finally, a sixth possible answer to the problem is intensionalism: namely, that some universals at least are the intensions of the classes of things to which the words apply: that property or properties that all and only the members of the class possess. For example, *even number* is the intension of the class of everything which is both a number and divisible by two: every member of the class of even numbers has these two properties, and everything which has these two properties is a member of the class. Intensionalism may not be a distinct answer, because intensions may only be abstract ideas — if there are any such things as abstract ideas, or any such things as intensions.

This sketch of the history of the problem of universals is instructive because the present theory of mind provides a Spinozistic type of solution: there are more than one kind of meaning to universals. In fact, there are four kinds. We need to examine them in order to discover which is the most valuable — which has the greatest hekergy, which is needed for wisdom.

35: Four Kinds of Universal

First of all, relations in the mind are theoretical ideas and serve very well as the conceptualists' notion of abstract ideas: relations, after all, are abstract entities and mathematics and logic, which are languages of relations, are the epitome of abstraction. So a theoretical idea is an abstract idea, and when it is bonded to a word it is a concept.

Furthermore, classes which are defined by a rule are defined by at least one relation, since every rule contains at least one relation. For example, a class might be defined by *everything similar to this* or by *everything in this room* or by *every number between 1 and 100*; and *similar to*, *in*, and *between* are relations. Such rules state what all and only the members of the class have in common, and thereby state intensions. So intensions contain at least one abstract idea. In fact, with the exception of intensions which have parts which are concrete images, all intensions are structures of abstract ideas and thus themselves abstract ideas. The rule which says *every number between 1 and 100* has as its meaning a structure of abstract ideas of *every*, *number*, *between*, *1*, *and*, and, *100*, all of which are relations in the mind. Such meanings will be called intensional meanings, while intensions which have concrete parts will be discussed in a moment. Intensional meanings thus are either relations or properties of relations.

The extensions of classes are a second kind of meaning: extensional meaning. All intensions define classes, so every intensional meaning produces an extensional meaning. However, not all extensional meanings produce intensional meanings, since some classes do not have intensions. These are classes that cannot be defined by a rule, they can only be defined by enumeration, by listing their members, as in the case of the class consisting of the number four, the square of four, the square root of four, and the natural logarithm of four; this four-membered class has no intension because what the members have in common — having four as part of their definition — does not belong to them exclusively: other things have four as part of their definition, such as the cube of four and the fourth power of four. The intension of a class is what all *and only* the members possess, it is exclusive to the members.

Thirdly, there are classes of concrete things: concrete empirical objects, and concrete images in the mind. No two members of one of these classes are ever exactly similar, they are only more or less similar; so the nearest to an intension of such a class would be *everything more or less similar to this*, and this is not a genuine intension because it is not precise. Putting it in the form *all and only those things more or less similar to this* shows the imprecision more clearly, in that we cannot be sure what belongs to the class and what does not. But we have to include classes such as these as one kind of meaning because they form naturally in the mind, by L.A.L.R.U. *More or less similar*

means *like*, and L.A.L.R.U. is like-attracts-like-and-repels-unlike. Thus these classes are formed irrationally; so this kind of extensional meaning will be called irrational extensional meaning.

There is a further kind of imprecision to irrational extensional meaning. If we have a series of things, each only slightly dissimilar to the next, then if the series is very long the difference between the first and last can be very great, so that the last is not more or less similar to the first. Such a series could be *all my ancestors*, which, if taken far enough, would include the first vertebrate fish. No doubt some of my adversaries would readily liken me to the first vertebrate fish, but insult does not entail a near likeness.

The fourth kind of meaning is nominal meaning. We have disallowed nominalism because it requires that all abstract words have only nominal meaning, and we have allowed abstract ideas. But we have to acknowledge that some words have only nominal meaning. Nominal meaning is the meaning found in the rules of the language game, as it was called by Wittgenstein. That is, nominal meaning is meaning by analogy to extensional or intensional meanings. We shall have an example of nominal meaning shortly, with the meaning of *nominal definition*. Also, some words have nominal meaning only because they are self-contradictory and so cannot have any meaning other than in language. For example, *square-circle* has some meaning: it means a geometrical plane figure which is both square and circular. So it is not meaningless. But, on the other hand, a square circle cannot exist except in language: we cannot imagine one, or draw one, or build one — we can only say, or write, *square-circle*.

36: Three Kinds of Meaning

Because some words have nothing but nominal meaning, while all extensional meanings require nominal meaning and all intensional meanings require extensional meaning, we have a hierarchy of meanings. If we have intensional meaning then we also have extensional and nominal meanings; if we have extensional meaning then we also have nominal meaning but do not necessarily have intensional meaning; and if we have nominal meaning we do not necessarily have extensional or intensional meanings. Another way of putting this is to say that intensional meaning is a sufficient condition for extensional meaning, which in turn is a sufficient condition for nominal meaning; but nominal meaning is only a necessary condition for extensional meaning, which in turn is only a necessary condition for intensional meaning. Yet another way is to say that the class of words which have nominal meanings contains the class of words with extensional meanings, which contains the class of words having intensional meanings. If all this seems confusing, a concrete analogy will help. Among humans, being a wife is a sufficient condition for being a woman, and being a woman is a sufficient condition for being female; but being female is only a necessary condition for being a woman, because some female humans are young girls, and being a woman is only a necessary condition for being a wife, because some women are not married; or, the class of female humans includes the class of women, which includes the class of wives.

We are going to be concerned with discovering the relative values of these three kinds of meaning; which is to say, with discovering their relative hekergies. This is because only those meanings of the highest hekergy will be relevant to profound truth and wisdom. So as illustrations we will look at the three kinds of meaning of each of the words *definition*, *necessity*, and *analyticity*.

Intensional definition is the relating of two or more abstract ideas, extensional definition is the relating of two or more classes or sets, and nominal definition is the relating of two or more words. Thus we can define a right triangle as a triangle one of whose angles is a right angle; we can define a stag as a male deer; and we can define a squircle as a square circle. In the first case we are combining two abstract ideas: the ideas of triangle and of right angle. In the second case we are specifying the intersection, or overlap, of two sets: the set of all male animals and the set of all deer. And in the third case we are defining something that does not exist because it is impossible, but our syntax is correct so we have a nominal definition. Obviously, we cannot define a right triangle without using words, so intensional definitions produce nominal definitions; and if there are abstract ideas of triangle and right angle then there are classes of them: the class of every triangle, and the class of every

right angle, and the intersection of these two classes gives us the extensional definition of right triangle — so intensional definition gives us extensional definition. And since naming this intersection is to make a nominal definition, extensional definition gives us nominal definition. Thus the intensional meaning is a sufficient condition for the extensional meaning, which is a sufficient condition for the nominal meaning. However, the reverse relationships are only necessary conditions: defining square circles does not produce members in the intersection of the class of squares and the class of circles; and defining the intersection of the classes of males and of deer does not produce intensions for these intensionless sets.

In each kind of definition a relation is involved: relations between abstract ideas, between classes, and between words; and since relations have hekergies we can evaluate the three kinds. In the first place, when we relate abstract ideas we may find that the emergent relation has novel properties, properties not possessed by any of its terms. For example, a right triangle has the property that Pythagoras' theorem is true of it, and in fact all of trigonometry emerges out of the relation. So the combination is more valuable than the sum of its parts. In the case of extensional definitions this does not happen because intersection, as a relation, does not have novel properties; so the definition is only as valuable as the sum of its parts. And in the case of nominal definition the relation is only between words; as such it may have some value, as in puns and in some poetic juxtapositions of words, but in the case of impossibilities it has no value other than to express the impossibility: "Squircles, defined as square circles, are impossible." Another way of looking at this is that if a uniting relation has novel properties then it unites its terms into a whole; so a right triangle both exists and is a whole. But intensionless sets are not wholes, and nor are their intersections, so the class of stags exists but is not a whole. And squircles are impossible, so they neither exist nor are wholes.

Necessity, our second illustration of the three kinds of meaning, is one of three categories traditionally called modalities: contingency, necessity, and impossibility. All three of these may be defined with the concept of possibility: that is, plural possibility, singular possibility, and zero possibility, respectively. If, given some antecedent condition, something is one of a variety of possibilities then it is contingent, if it the only possibility then it is necessary, and if it is not a possibility at all then it is impossible. For example, if you draw a card from a well shuffled deck then there are fifty two possibilities of cards to be drawn, so what card you actually draw is contingent. If you multiply the number 17 by 3, there is only one possibility for the correct result: 51; so the result is necessary. If you try to combine the concepts of square and circle to get a square circle, there is zero chance of success (other than in language,

which does not count, being nominal only in this case), so square circles are impossible. This is comparable to the three moral possibilities of permitted, required, and forbidden: something is permitted if it is one of several moral possibilities concerning what you may do in a given situation, it is required if it is the only moral possibility in that situation, and it is forbidden if it is not a moral possibility at all.

Intensional necessity is a singular possibility in this way, and it is one of two kinds: it is either a relation, or an extrinsic property of a relation. Causation is an example of a relation of necessity: the cause necessitates the effect and this necessity is a relation of singular possibility, between the cause and the effect. Logical necessity is another example: the truth of the premise necessitates the truth of the conclusion, meaning that if the premise is true there is only one possibility for the conclusion, truth; and since truth is a relation between ideas and reality, this necessity is a relation between two relations: a relation of necessity between two relations of truth.

The kind of intensional necessity that is an extrinsic property occurs with distributive and compositional properties. We saw in Chapter 2 that if a whole has a distributive property then so does every part, and if a part has a compositional property then so does the whole. This was in connection with identity and change: identity is a distributive property, so that if a whole has identity through time then so does every part of that whole; and change is a compositional property, so that if a part changes then so does the whole. We can be a little more precise here: a distributive property is a property of a relation, such that if the relation has it then so do all of its terms; and a compositional property is a property of a term, such that if a term has it then does the relation which relates that term. Since a whole is a set of parts united by a relation, if the uniting relation has a distributive property then so does each part of the whole, and if a part has a compositional property then so does the whole. In each case there is intensional necessity, necessity as an extrinsic property: if the uniting relation has a distributive property then *necessarily* every term has it as well, and if a term has a compositional property then *necessarily* so does the uniting relation. We saw this with identity and change, and we can see it also with existence and logical consistency. Thus if the whole exists then the parts must exist, and if the whole is consistent — that is, does not contain or imply any contradictions — then the parts must be consistent. This necessary existence and necessary consistency are each an extrinsic property of each part: the part exists because the uniting relation exists. Similarly, if a part has a compositional property, such as non-existence or inconsistency, then so does the uniting relation of the whole, necessarily; and this necessary non-existence or inconsistency is an extrinsic property of the uniting relation, and so of the whole. That is, if one or more of the terms of a

relation cease to exist then the relation ceases to exist, and if one part of a theory — a structure of abstract ideas — is inconsistent then so is the whole theory. (Properly speaking, non-existence and inconsistency are only nominal properties: no relations possess them; but they serve well as illustrations.)

Extensional necessity is not singular possibility, it is universality, which may be a consequence of singular possibility. It is a fact that theoretical causation is not imaged into empirical worlds as a necessity, but only as a correlation. Such correlations are sometimes called empirical necessities, but they are not really necessities, in the sense of singular possibilities, they are only universalities. Scientific laws state such universalities, as in the common sense example of the law that the Sun will rise tomorrow. We believe that it will rise tomorrow because it has so risen every day of our lives, and indeed for about five billion years, which is good grounds for believing in the universality of the dawn. But we can imagine it not rising, we can imagine the rotation of the Earth stopping, so that one side would get very hot and the other very cold, and there would be no more dawns. This is the difference between necessity and universality: we cannot imagine, or think, of a necessity being otherwise, but we can of a universality. (We can *say*, or *write*, the denial of a necessity, but this is not to imagine or think it: to imagine is to have concrete images in consciousness and to think is to have abstract ideas in consciousness. To say or write the denial of a necessity is to define with nominal meaning only.) Corresponding to the other two modalities — contingency and impossibility — there are the extensional meanings: sometimes and never. So we can compare the intensional modalities, singular, plural, and zero possibilities, with the extensional ones: always, sometimes, and never.

The nominal meaning of necessity, or nominal necessity, is what in logic is called a tautology, which is a statement which is always true by virtue of its syntax. For example, if we combine two concepts such as *man* and *unmarried*, then “All unmarried men are unmarried” and “All unmarried men are men” are both tautologies. So, with the same syntax, we can say that “All square circles are square” and “All square circles are circular” and we have two more tautologies, two more nominal necessities. But there are no square circles, they are impossible, so these last two tautologies have nothing but nominal meaning, meaning by analogy of syntax.

Notice that singular possibility is a sufficient condition for universality, which is a sufficient condition for tautology, but the converse relationships are only necessary conditions.

Our third example of the three kinds of meaning is with the three meanings of *analyticity*. Grammatically, a statement is analytic only if the subject has the predicate necessarily. Thus “All women are female” is analytic, or analytically true, as it is sometimes put, and “Some women are pregnant” is

not analytic. In the first *women* is the subject and *female* is the predicate, while the second has the same subject and *pregnant* is the predicate. The first is analytic because the definition of *woman* as an adult female human means that the statement is equivalent to "All adult female humans are female," which is necessarily true; and the second is not analytic because although it is in fact true that some women are pregnant, it is not necessarily true: if the human race were struck with universal infertility (thus curing our gross over-population) there would be no pregnant women.

There are two traditional definitions of analyticity. One is that in an analytic statement the predicate is contained in the subject, and the other is that if you deny an analytic statement you get a contradiction. Thus the phrase *adult female human* contains the word *female*, and an adult female human who is not female is a contradiction; while *adult female human* does not contain *pregnant* and a non-pregnant woman is not a contradiction, so is not analytic.

However there is a problem with the containment definition. It works well with the example above, but there are other cases in which it seemingly does not work. *All equilateral triangles are equiangular* is an analytic statement because triangles with all sides equal necessarily have all their angles equal; but the words *equilateral triangle* do not contain the word *equiangular*. So modern logicians avoid the containment definition of analyticity, in favour of the denial definition; because if you deny that an equilateral triangle is equiangular then you get a contradiction. In other words, the containment definition seems not to work all the time, while the contradiction definition does always work.

When we examine the three meanings of analyticity, all of this is neatly sorted out.

Intensional analyticity occurs when the abstract idea of the predicate is contained in the abstract idea of the subject. The containment refers to abstract ideas, not to the words for them. So the abstract idea of an equilateral triangle contains the abstract idea of equiangularity. This is because when you combine the abstract ideas of triangle and equilateral, the relation of equiangularity emerges, necessarily. In the same way if you combine the abstract ideas of triangle and right angle into a right triangle, there emerge Pythagoras' theorem and all of trigonometry; so an abstract idea of a right triangle contains this theorem and trigonometry, and the theorem and trigonometry follow analytically from the definition of right triangle.

Extensional analyticity also occurs with containment, but the opposite way round from intensional analyticity. It occurs when the subject class is contained in the predicate class. For example, the class or set of all women is a subset, or is contained in, the class of females: women are some among all females, or, women are universally female. So intensionally the predicate idea

is contained in the subject idea, while extensionally the subject class is contained in the predicate class. The abstract idea of a right triangle contains the abstract idea of triangle, and the set of all triangles contains, as a subset, the set of all right triangles. Intensional analyticity is a sufficient condition for extensional analyticity, but extensional analyticity is only a necessary condition for intensional analyticity, because intensional analyticity is based on necessity and extensional analyticity is based on universality.

Nominal analyticity occurs when a statement is tautologous, when it is always true, syntactically. "All right triangles are triangles" and "All square circles are square" are both nominally analytically true by virtue of their syntax, but the first is also intensionally and extensionally analytic, while the second is only nominally analytic. If we deny these we get "Some right triangles are not triangles" and "Some square circles are not square," both of which are contradictions.

But contradictions have only nominal meaning, they occur only in language[21]. So the criterion of analyticity, that denial of it leads to a contradiction, is a nominal criterion. And the criterion that the predicate is contained in the subject has only intensional meaning, so it is an intensional criterion. Thus the two criteria are not equivalent. Most modern logicians, being nominalists, argue that the intensional definition of analyticity, in terms of containment, is too vague, so that the nominal definition, by means of non-contradiction, is to be preferred. This is not to throw out the baby with the bath water, it is to throw out the baby and keep the bath water.

The importance of intensional analyticity is that, because it involves relations, cascading emergence is possible with it. We saw an example with the concept of right triangle, out of which emerge Pythagoras' theorem and trigonometry. In general such emergence occurs with axiom sets. An axiom set is a set of primitive — undefined — concepts and assumed propositions about them — axioms — such that from them new concepts may be defined and theorems deduced. The definitions and theorems are emergent out of the abstract ideas and propositions in the axiom set, so that they are contained in the axiom set, their truth follows analytically from the truth of the axiom set. That is, if the axiom set is similarity true, relative to reality, then all the definitions and theorems are necessarily similarity true also. This is because if

[21] To be sure, we earlier spoke of illusions as empirical contradictions. But they are only so within the context of naive realism. If you believe that the half-immersed stick is a real stick then you have an empirical contradiction, since one real stick is both bent to sight and not bent to touch; but if you understand it to consist of two images, a visual image being a bent stick and a tactile image being a straight stick, then there is no contradiction — unless you insist that the two images are one and the same, identical.

reality has relations similar to those of the primitive concepts and axioms of the axiom set, then necessarily there will emerge further real relations out of these — just as further ideal relations emerge in the mind of the theorist working with this axiom set, out of the abstract ideas in the axiom set. Emergence is necessary, it is compositional necessary existence, so the relations which emerge as abstract ideas in the theorist's mind must be similar to those which emerge in reality.

This feature of axiom sets is sometimes called their generosity. It occurs in rational thought — primarily mathematics, which is our main language of relations. That axiom generosity can be explained by means of intensional meaning is one of the important consequences of distinguishing intensional meaning from the other two kinds. Neither extensional analyticity nor nominal analyticity can be generous in this way. The word *generosity* is quite appropriate here, because some axiom sets are more generous than others, and the measure of their generosity is the quantity of emergents that they produce. Since emergent relations have hekergy, the greater the generosity of an axiom set, the greater its value. Thus intensional analyticity and intensional axiom sets are the most valuable kinds. And we will discover that wisdom is valuable because it is based on intensional meaning. This is why we have spent so long on the otherwise perhaps tedious problem of universals.

Intensional meaning is more valuable than extensional meaning, which is more valuable than nominal meaning, for two further reasons. One we have come across already: contradiction is possible with nominal meaning but not with extensional or intensional meanings. As we have seen, contradictions are possible only in language, and the linguistic statement of a contradiction has nominal meaning only.

The second reason that intensional meaning is the most valuable is that there is least arbitrariness in intensional meaning, and most in nominal meaning. Intensionally, one can arbitrarily combine abstract ideas in the hope of making other abstract ideas emerge; but what emerges, if anything, is entirely unarbitrary because it is necessitated. This does not happen with extensional meanings, so more arbitrariness is possible with them, and still more arbitrariness is possible with nominal meanings. We can see this clearly from the fact that intensional meanings are thinkable, extensional meanings are imaginable, and nominal meanings are speakable. We can speak the unimaginable, as with *square circle*, and we can imagine the unthinkable, as with the elixir of youth and the philosophers' stone, but we cannot think the unthinkable.

It can happen that all the ideas of a certain area of thought are analytically related, and so have an ordering of maximum hekergy, and so are rationally ordered. This happens with an axiomatic system. Given the truth of

the axioms, all the theorems are necessarily true, because the theorems are contained in the axioms, the whole system is analytic. The theorems are not *verbally* contained in the axioms, they are *ideally* contained in them, in the sense of ideas being contained within ideas. That is, the whole axiomatic system may be expressed verbally: the primitive terms and the axioms stated, the definitions declared, and then the theorems deduced, step by rigorous verbal step; but there is no sense in which the earlier statements contain the theorems. It is the theoretical ideas bonded to the verbal terms, and the propositions, composed of these ideas and bonded to the statements, which have this relation of containment. The axioms do not individually contain the theorems, because the theorems only emerge when the axioms are related together, into a whole; but with all the axioms united into one system of theoretical ideas, all the theorems emerge and are a part of the system — so they are analytically contained in the axiomatic system.

This emergence of theorems in an axiomatic system can only occur with intensional analyticity, with intensional meanings. This is because intensional meanings are theoretical ideas, abstract ideas, which are relations in the mind; and only relations have this trick of emerging out of arrangements of their terms. And as we saw, the fewer the number of arrangements that produce an emergent relation, the higher the hekergy of that emergent. If there is only one arrangement that produces an emergent then that emergent has maximum hekergy; and, also, that one possibility is a singular possibility, a necessity. Thus axiomatic systems have the greatest absolute value, among all possible arrangements of their primitive and defined terms. Systems of extensional thought, such as taxonomic biology, cannot have as much value, and systems of nominal thought, such as those using irrational extensional meanings, or classes formed by L.A.L.R.U., have even less; indeed, purely extensional or purely nominal systems of thought cannot have the wealth of emergents that intensional systems have, since their meanings are not relations.

37: Rational Feelings

Enough, for now, of rational meanings: let us turn to rational feelings. Feelings, remember, are consciousness of the hekergies of theoretical ideas, as opposed to thoughts, which are consciousness of the structures of theoretical ideas; and such hekergies are values, while such structures are meanings. So feelings are evaluative. Rational feelings mostly occur in the realm of art, so that we need to say what art is. But first we should examine a few irrational feelings, by way of contrast.

Malice is an irrational feeling, a desire to give oneself the illusion of relative betterment by diminishing someone else. And the satisfaction of malice successfully achieved is another feeling, the illusion itself of ego hekergy increase. Both of these feelings are a product of ego-oge interaction, and since ego, oge, and their interactions are all based on L.A.L.R.U., these feelings are irrational. Indeed, almost all inter-personal feelings are irrational for this reason: feelings of love and hate, respect and contempt, concern and indifference, triumph and defeat, elation and depression, friendship, loyalty, generosity, etc.

Art, on the other hand, concerns rational feelings, feelings produced by hekergies that are the maximum possible. This is shown by our concept of perfection: perfection is such that any rearrangement of its parts destroys the perfection. Perfection is an emergent relation, emergent out of a set of terms, and it emerges with only one arrangement of those terms and so has maximum hekergy. Any rearrangement of the terms submerges the perfection. For example, any rearrangement of the notes, tempo, volume, or any other parts of a perfect piece of music, ruins it. So a work of art may be defined as any structure of maximum hekergy, or near maximum hekergy; as such, the feelings it generates are rational feelings, as opposed to irrational ones.

This definition may seem odd, in that the rational is essentially abstract, while most art seems to be concrete. The statue is made of concrete marble or bronze, the painting of patches of concrete colour, music of concrete sounds, poetry of concrete words, gourmet meals of concrete foods, beautiful gardens of concrete plants, and elegant dresses of concrete fabrics — to say nothing of the art of nature, such as beautiful sunsets, faces, bodies, and landscapes. The explanation of this is the same as the explanation of empirical relations. Empirical relations, remember, are relations which we perceive in the empirical world, the world we each consciously occupy. Relations cannot exist without their terms, and we perceive concrete sensations only in order to be able to perceive empirical relations. The concrete sensations are secondary qualities, manufactured by the sense organs, and as such are illusory; but they are essential to the perception of relations which are the true features of empirical worlds, since these relations have the sensations as their terms and

cannot exist without them. In the same way, art consists of relations, which cannot exist without the concrete stuffs of the artists' media. It is true that the individual sounds of orchestral instruments are beautiful in themselves, as are many artists' colours and poets' words; but music, painting and poetry are much more than these, and the much more is relations between them. Harmony, order, and pattern are all relations, as is beauty; and when they emerge with singular possibilities, they have maximum hekergy, they are perfect, they are the most valuable, and the feelings they produce are the highest. These are rational feelings, and they are characterised by necessity as well as perfection.

Rational feelings are not confined to great art, as any mature feeling-person well knows. Maturity of mind in adults is growth away from the irrational into increasing rationality; which is to say, from L.A.L.R.U. ordering of theoretical ideas to greater and greater hekergy. So as feeling people mature they increasingly feel that a feeling of evil is a false evaluation of tragedy, that what they feel that other people think of them is false, that contempt is contemptible, and that malicious or sadistic humour is not funny; and their attitudes change from pride to humility, from selfishness to charity, and from ambition to acceptance. Maturation is movement towards wisdom, but wisdom requires much more than these changes: because both the ego and the oge are irrationally ordered, and need to be re-ordered rationally — with maximum hekergy — for the maximum hekergy of mind which is wisdom.

38: Four More Gods

In Chapter 27 we considered that one meaning of the word God is the oge: a God who is an agent hence a person, with human feelings such as love and mercy, and a human desire for justice which sends oge-people to Heaven or Hell, which are parts of the oge; an agent able to answer some prayers from the ego, demanding worship by the oge-dominated ego, and transcendent because beyond the empirical blue sky; but irrational except for introjected rational beliefs, definitely finite, and far from being omnipotent and omniscient. Because the oge is essentially social, any religion that has congregations, public worship, or any other group activities is a religion devoted to an oge God.

Now is the time to consider four other meanings of the word God.

One is the mind hekergy principle, which is the principle that the mind must increase hekergy whenever possible, or else at least preserve it, or else at least minimise its loss. This is the driving force of the mind, which produces the ego, by L.A.L.R.U. If the ego be thought of as the soul, then this principle is the cause of the soul, the creator of the soul. It also is the source of all creativity in the mind.

The second is the deified teacher: a religious prophet so revered by believers of his teachings that he or she continues to exist as an oge-person for generations of oges beyond their earthly time. Christ and Buddha are two examples. As oge-people they exist in the oge, near the sky pole, and are created anew in the children of believers, by introjection. Which is to say that they exist in heaven, or paradise, next to God the oge, and are immortal.

In Christian theology the oge god is the Father, the deified teacher is the Son, and the mind hekergy principle is the Holy Ghost. Understood in this way, the Trinity certainly exists for believers. Equally, the paradoxical nature of the Trinity is clear, since monotheism is of very great importance to those who worship the oge God. If the God is one, rather than many, then the trinity must be one; and yet it is clearly three. The standard theologians' answer to this problem, that this is a mystery that tests the faith of the ego, is hardly satisfactory. That the oge must be one, rather than the many gods of, say, ancient Egypt, Greece, or Rome, is because if the oge is unified into a whole then it has much greater hekergy than if it is a mere multitude; and with far greater hekergy, it is far more valuable, so closer to perfection. Consequently to those who intuit the nature of the oge — those who are at least lesser religious teachers — a unified oge is so valuable that polytheism is unthinkable. Hence the three Gods of the Trinity must somehow be one.

The remaining two meanings of the word God are far more important. One of them is the theoretical world. If we use the word creator in place of cause, then the theoretical world is the creator of the empirical world of each of

us, via theoretical perception. (For common sense all these empirical worlds are one world, the real world; so for common sense there is a God who is creator of this one real world and who is easily identified with the oge god; but they cannot be identified because they are qualitatively different.) Not only that, but the theoretical world is the creator of the theoretical mind of each of us, including the mind hekergy principle, and so is the creator of the soul, or ego, of each of us, hence creator of our empirical worlds and source of all creativity. Being beyond the blue sky, this God is transcendent to each empirical world; but since in the final analysis each theoretical mind is part of the theoretical world, this God is also immanent to each empirical world and empirical mind. If causal necessity be thought of as power, then, since all theoretical causation is in the theoretical world, this God, this Creator, is all-powerful. And since the theoretical world is the best of all possible worlds, this God is perfect: it has maximum hekergy; and being necessary, it is *causa sui*, or self caused. However, this God is not a person, is not conscious, loving, just, or merciful, does not demand worship, and does not answer prayers.

Another interpretation of the Trinity is that the theoretical world is the Father, the theoretical mind is the Son, and the mind hekergy principle is the Holy Ghost. This interpretation has the advantage that in the final analysis the theoretical world is a single indivisible entity, a unity, and so all supposed parts of it are one with it; hence the trinity is one. But so are all individual people one with this God: the final analysis is only properly comprehensible in the state of wisdom, in which the distinction between the me and the not-me vanishes.

Finally, the fifth meaning of the word God is a third major complex, or agent, in the theoretical mind. The ego and the oge are the first two agents, and are characteristically irrational, since they are formed by L.A.L.R.U. The third complex is characteristically rational. I have named it the psychohelios, which means sun of the mind, after Plato's likening of the Form of the Good to a sun in the mind. Plato's theory of Forms was a theory of wisdom: to know the Forms was to achieve wisdom, and of all the Forms the greatest was the Form of the Good. For us the good is hekergy, and the psychohelios is the complex of all theoretically real ideas which are arranged with maximum hekergy. It is a structure of perfection, the most valuable part of the mind. Let us consider some of its features.

The psychohelios grows as a part of the ego, the rational part of the ego, as a result of the ego thinking or feeling rationally. The ego does this in order to increase its hekergy: theoretical ideas on its periphery can be ordered with maximum hekergy instead of by L.A.L.R.U. through suitable attention by the ego. The psychohelios will also grow through the ego being taught rational

theories by other people, or through reading, or through appreciation of beauty, or even, conceivably, by watching television.

The essential feature of the psychohelios is that it is absolutely true. This is truth by similarity to the theoretical world, which world, it will be recalled, has maximum hekergy; since the psychohelios also has maximum hekergy, it must be similar to the theoretical world. It is not similar to every detail in the theoretical world, since it has far less detail than that; but every detail that it does have is true. Compared with the court oath to tell the truth, the whole truth, and nothing but the truth, the psychohelios is nothing but the truth although it is not the whole truth.

It can happen, of course, that a theory has very close to maximum hekergy, but still has a few contingencies in it. It will then occupy a region between the ego and the psychohelios, as a structure intermediate in kind between the two: intermediate between an L.A.L.R.U. structure and a structure of maximum hekergy.

The psychohelios is the source of the intuition known by a creative thinker or artist. A thinker may worry at a problem for a long while without success and then suddenly have the solution in mind, perhaps while doing something completely different. Or a poet may wake with a complete poem in mind, or an artist with a picture. What happens in such cases is that the psychohelios grows in the unconscious mind, and the sudden intuition is an intuition of the new truth or the new beauty in the psychohelios. Intuition was explained earlier as the ego becoming conscious of some part of the unconscious mind. For example, the ego might intuit the existence of the oge, and some of the nature of the oge, and interpret this as religious insight or revelation, or perhaps as astrological insight — since the oge is roughly where the empirical planets are. The enormous significance of intuitions, by the ego, of the psychohelios is that they are all true. We thus have a wonderful source of truth; truth which might be called revelation, since the psychohelios is one meaning of the word God. Not only is this revelation, but it is revelation about the nature of God: the nature of the God that is the theoretical world. When discussing theoretical science earlier, we discovered that both theoretical science and metaphysics are attempts to describe the theoretical world; we now learn that not only do both these have the same subject matter, but theology does as well — another unification of ideas on the road to wisdom.

Needless to say, such revelation from the psychohelios should not be confused with the revelation which is intuition of part of the nature of the oge. And herein lies a problem concerning the nature of true intuitions: the ego is easily confused between true intuitions, on the one hand, and intuitions of other parts of the unconscious mind, on the other. In particular, the experience of a true intuition is indistinguishable from that of a prejudice: both produce

feelings of strong conviction. With a few exceptions, strong conviction is thus not proof of truth, although the ego who has that conviction will be very loath to doubt it. We have seen that the beliefs of common sense are very strongly held by almost everyone: held strongly enough to make sophists of otherwise rational and intelligent people. Proof of truth of a strong conviction is difficult: it requires formal integration of the content of the conviction into the rest of the theoretical world view, assuming that this world view is itself part of the psychohelios and so true.

The exceptions to conviction being unreliable are the intuitions of geniuses. Einstein must have had a very strong conviction of the truth of his theories of relativity, because they united two major theories: the Newtonian theory of gravitation, and Maxwell's theory of electromagnetism, which previously were incompatible. It turned out that Newton's theory required a minor correction, after which the incompatibility of the two theories was cured. Such success produces a conviction which cannot be denied. This is why the intuitions of geniuses should not be ignored — a point worth making since Einstein had one famous intuition which contradicts the foundation of quantum mechanics. This is expressed by his saying that God does not play dice: there are no chance events in reality. Not only is quantum mechanics based upon radical chance, but it is by far the most successful theory in the entire history of science. Because of this, most physicists choose quantum mechanics over Einstein's intuition. Yet there are two reasons for siding with Einstein. One is psychological: genuine scientists and genuine philosophers are motivated by one thing: by curiosity about reality. They want to know why. And to ask why is to ask for an explanation, which, as we have seen, is to ask for causes: description of causes is explanation of their effects. So if something is a chance event, which means that it is uncaused, then it is inexplicable. Scientists and philosophers who believe that everything is explicable are determinists: they believe that everything is caused, and can therefore be explained truly. This belief could be a true intuition, as Einstein's may well be, or it could be irrational, based on the desire for everything to be explicable. The second reason for siding with Einstein is that in our present theory the theoretical world is the necessary world, the best of all possibles, which contains no contingencies and therefore contains no chance events. It is rational, in the sense that everything is necessitated, everything occurs with singular possibility; and also in the sense that the psychohelios is both rational and a true copy of reality. So there remains a wonderful problem for some genius to solve: how can quantum mechanics, as a theory, be completed so as to be deterministic, and thereby comprehensible?

To return to the psychohelios as one meaning of the word God: the psychohelios is the God of the mystics, who speak of the possibility of union

with God, and claim that it is the greatest achievement possible for a human being. The mystics' claims about union with God is the same as the philosophers' claims about the possibility of wisdom: both are claims about the real possibility of the mind reaching maximum hekergy. So we have, in passing, another unification: that of the goal of philosophy (and of theoretical science) with that of religion.

We may characterise three of these Gods in another way: the oge is a moral God, all-good and sometimes all-loving; the psychohelios is an all-knowing God; and the theoretical world is an all-powerful God. Not only is the identification of all three into one a gross example of the identity error, but the identification of all the oges of one congregation is another serious case of the identity error, as is the identification of all psychohelioses. Once these identity errors are corrected the traditional problem of evil is resolved. This is the problem that supposedly one God is all-loving, all-knowing, and all-powerful, yet evil exists. Such a God would have to know that evil exists, would have to want to abolish it, and would be able to do so — so why does evil still exist? One answer is that the all-loving God is neither all-powerful nor all-knowing and so cannot abolish evil, while an all-powerful God is not all-loving so does not want to abolish it. A better answer is that the all-knowing God knows evil to be an illusion — all evil is in the mind of the beholder.

It now remains to explain how the common goal of philosophy, science, and religion is reached, and what the result might be like for those who achieve it.

39: Practice Makes Perfect

First, if the mind is to reach maximum hekergy, then all irrationally arranged ideas — ideas arranged by L.A.L.R.U. — must be rearranged into one rational structure, one structure of maximum hekergy. This means that the ego itself must be broken up and its ideas rearranged into the structure of the psychohelios. This is a very strange thought, for the ego is that part of the mind referred to by the words *I* and *me.* How can I be broken up and rearranged? What would happen to my consciousness if I, as an ego, were broken up? How could I continue to act if I, as an ego, were broken up? To be broken up in this way is the death of the ego, and how can an agent such as the ego, behaving in accordance with the mind hekergy principle, permit such a death of itself? Furthermore, the ego contains the empirical world, so that the death of the ego would be the end of the world. Not only this, but the oge, as well as the ego, would have to be rearranged into a structure of maximum hekergy, requiring an antisocial destruction of the moral sense, the elimination of the guardian of right, the end of Heaven and Hell and all their denizens, and the death of the oge-God.

Much of this is to be found in mystical teachings, although it is generally misinterpreted into dogmas comprehensible at the Sunday School level. Thus the mystics teach that salvation requires the death of the soul, and its rebirth in union with God, in a state of ineffable, eternal, and ecstatic bliss. This means that the ego must die and that consciousness must be reborn in the psychohelios. And the Sunday school interpretation of this is that the individual must die physically, and his or her body and soul be resurrected in either Heaven, where it resides in perpetual bliss, or in Hell, in perpetual agony. This interpretation is not entirely false, as atheists assert, because individuals do survive their death, for a while, as oge-people in the minds of those who remember them. As such they are like the Greek shades in Hades, who do not know who they are, nor remember their past lives. Oge-people are conscious, by L.A.L.R.U., just as the ego and the oge are conscious, but it is a very inferior consciousness because their hekergies are so small, compared with that of the ego.

The key to understanding the nature of wisdom is the elimination of irrationality and, equivalently, the essential point of the mystical teaching is the concept of union with God: the irrational ego and oge must be rearranged with maximum hekergy in the psychohelios. Two points arise out of this: (i) how can this be done, and (ii) what would the experience of it be like? The first question is easily answered, the second not; this is because our language has developed to deal with the irrational and the rational, while the state of maximum hekergy of mind could well be described as supra-rational, and hence supra-linguistic. The mystics called this *ineffable*, meaning the

unutterable, that which cannot be put into words. This is why they are mystics — people who should never be confused with those who indulge in mystification for its own sake — the childish pretence of "I've got a secret, but I'm not telling" kind of mystification. In spite of being ineffable, however, our understanding of the Leibniz-Russell theory, our understanding of the nature of relations and hekergy, and our understanding of the present theory of mind, all help a great deal in communicating what wisdom might be like. Those painful belief shocks are beginning to pay off.

The first point to be made concerning how wisdom might be achieved is that the ego must be mature. In a young ego the psychohelios simply does not yet exist, so that dissolution of this ego would merely produce schizophrenia. I am told that there is a Hindu teaching that a man, in order to know God, should have a career, marry, raise a family, make a fortune, and then, when his children are raised, give away his fortune to his family and to charity and become a beggar. In other words, his ego must grow to a maximum before starting on the road to self-diminution.

How can the ego practice self-diminution when the mind-hekergy principle requires the ego to increase its hekergy, or, if this is not possible, to prevent its loss, or, if this is not possible, to minimise the loss? The very simple answer to this question is, in its way, staggering. We have seen already a case in which the ego can do this: when it gives unconditionally to its beloved, which it is able to do through bonding, or identification, with its beloved. In other words, the ego can diminish itself through love. In this case, through love of God. In the first instance, it is love of the oge-god, which begins the changeover from ego-oge conflict to ego-oge harmony. Later, the love of God is the love of the psychohelios, which may be aided by charity, by self-denial, or by meditation.

The second stage towards wisdom is the development of the psychohelios. This means that the ego must, over time, gain as large and detailed and unified an understanding of reality as possible. In the very early days of science Plato recommended for this the study of mathematics, music, and astronomy, the appreciation of beauty, and the practice of dialectic. We have seen how mathematics and music can be unified, and astronomy has always been mathematical — it cannot be otherwise. And if reality is mathematical, because consisting of relations, and the psychohelios is a true replica of reality, then clearly the psychohelios has a mathematical structure. But it is much more than this. It also has maximum hekergy. It is perfectly beautiful. And we have seen how mathematics can be beautiful. So appreciation of mathematical beauty enlarges the psychohelios. Also, the psychohelios is not a matter of knowledge, it is matter of understanding. Knowledge is ideas of facts, understanding is relating knowledge into larger

and larger unified structures. For Plato, dialectic was a great aid to this. Dialectic is conversation — as opposed to debate, lecturing, and preaching — between lovers of wisdom so as to increase understanding.

Today, growth of the psychohelios may be encouraged through striving for intellectual and artistic maturity. Lifelong study of mathematics, various sciences, philosophy, theology, history, biography, etc., and lifelong appreciation of music, painting, sculpture, poetry, literature, theatre, etc.

The third, and most difficult, stage towards wisdom is the diminution of the ego and the oge. One reason for this difficulty is that *this stage cannot be taught.* To teach it is for an ego to be told to diminish itself, and *to be told this by the oge*, such that reversion to ego-oge conflict can hardly be avoided. With the possible exception of a very ego-dominant personality, outside discipline is fatal to the third stage. This is why monasteries and nunneries have failed so conspicuously in the past, and why many spiritual leaders speak in riddles. The spiritual aspirant has to decide for himself or herself what to do next, at every point of this third stage; a correct decision leads to progress and an incorrect one stops progress. All that a teacher can do is to mention possibilities, without any recommendations. Most teachers, unfortunately, cannot resist making recommendations — usually those which work best for themselves — so that the aspirant should study them for the possibilities they raise while ignoring their counselling. Such teachers are, of course, the great mystics and the great philosophers, including, needless to say, Jesus, Mahomet, and Budda.

So much for how the suprarational might be achieved. We next consider what it might be like, and what its content might be. This is something like trying to describe colour to a blind man, but something can be communicated about it — mostly by describing what it is not. It is, first of all, consciousness without an ego: it is the psychohelios' consciousness of itself.

Because there is no ego any more, the egocentric co-ordinate system, whose origin is *I-here-now*, ceases to exist.

Although there is no *I*, your suprarational state would include you because the psychohelios portrays reality and you are part of reality, but you are not distinct from reality, as when you were an ego. An essential feature of reality, remember, is its unity; the distinction between you and the not-you is an ego distinction, which disappears in the suprarational state. You, as a part of the psychohelios, would participate in the psychohelios' self-consciousness, without being distinct from it. You participate in the self-consciousness by, and of, absolute truth, absolute goodness, absolute beauty, absolute unity, absolute hekergy. This is the meaning of union with God.

Because there is no *here*, there is no centre of consciousness: the suprarational is all of ideal space-time conscious of itself. The absence of *here* means the absence of your empirical body, which defined the I-here-now, and

this feature of suprarational consciousness the mystics called *ecstasy*, a state of bliss in which the soul, liberated from the body, is absorbed in the contemplation of divinity.

Because there is no *now*, there is no passage of time. We saw, in the discussion of the problem of identity and change, that passage of time must be illusion. Consciousness without this illusion is what the mystics called *eternity*. Usually understood as infinite time, or time without either beginning or end, the proper meaning of this word is timelessness, consciousness without passage of time.

All other illusions of irrationality also must vanish in the suprarational state: all concrete qualities — secondary qualities — such as colours, sounds, and tastes; chance; freedom of the will; and classes and classification. It is exceedingly difficult to contemplate consciousness without all these things, but not impossible. What remains is maximum hekergy of mind, the most valuable state possible for a human being.

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