

Richard Dawkins

THE GOD DELUSION

Books by Richard Dawkins

THE SELFISH GENE

THE EXTENDED PHENOTYPE

THE BLIND WATCHMAKER

RIVER OUT OF EDEN

CLIMBING MOUNT IMPROBABLE

UNWEAVING THE RAINBOW

A DEVIL'S CHAPLAIN

THE ANCESTOR'S TALE

THE GOD DELUSION



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whenever and wherever opportunity offers, at the improvement of each organic being. If a wild animal habitually performs some useless activity, natural selection will favour rival individuals who devote the time and energy, instead, to surviving and reproducing. Nature cannot afford frivolous *jeux d'esprit*. Ruthless utilitarianism trumps, even if it doesn't always seem that way.

On the face of it, the tail of a peacock is a *jeu d'esprit par excellence*. It surely does no favours to the survival of its possessor. But it does benefit the genes that distinguish him from his less spectacular rivals. The tail is an advertisement, which buys its place in the economy of nature by attracting females. The same is true of the labour and time that a male bower bird devotes to his bower: a sort of external tail built of grass, twigs, colourful berries, flowers and, when available, beads, baubles and bottle caps. Or, to choose an example that doesn't involve advertising, there is 'anting': the odd habit of birds, such as jays, of 'bathing' in an ants' nest or otherwise applying ants to the feathers. Nobody is sure what the benefit of anting is – perhaps some kind of hygiene, cleaning out parasites from the feathers; there are various other hypotheses, none of them strongly supported by evidence. But uncertainty as to details doesn't – nor should it – stop Darwinians from presuming, with great confidence, that anting must be 'for' something. In this case common sense might agree, but Darwinian logic has a particular reason for thinking that, if the birds didn't do it, their statistical prospects of genetic success would be damaged, even if we don't yet know the precise route of the damage. The conclusion follows from the twin premises that natural selection punishes wastage of time and energy, and that birds are consistently observed to devote time and energy to anting. If there is a one-sentence manifesto of this 'adaptationist' principle, it was expressed – admittedly in somewhat extreme and exaggerated terms – by the distinguished Harvard geneticist Richard Lewontin: 'That is the one point which I think all evolutionists are agreed upon, that it is virtually impossible to

CHAPTER 5

THE ROOTS OF RELIGION

To an evolutionary psychologist, the universal extravagance of religious rituals, with their costs in time, resources, pain and privation, should suggest as vividly as a mandrill's bottom that religion may be adaptive.

— MAREK KOHN

THE DARWINIAN IMPERATIVE

Everybody has their own pet theory of where religion comes from and why all human cultures have it. It gives consolation and comfort. It fosters togetherness in groups. It satisfies our yearning to understand why we exist. I shall come to explanations of this kind in a moment, but I want to begin with a prior question, one that takes precedence for reasons we shall see: a Darwinian question about natural selection.

Knowing that we are products of Darwinian evolution, we should ask what pressure or pressures exerted by natural selection originally favoured the impulse to religion. The question gains urgency from standard Darwinian considerations of economy. Religion is so wasteful, so extravagant; and Darwinian selection habitually targets and eliminates waste. Nature is a miserly accountant, grudging the pennies, watching the clock, punishing the smallest extravagance. Unrelentingly and unceasingly, as Darwin explained, 'natural selection is daily and hourly scrutinising, throughout the world, every variation, even the slightest; rejecting that which is bad, preserving and adding up all that is good; silently and insensibly working,

do a better job than an organism is doing in its own environment.⁷⁵ If anting wasn't positively useful for survival and reproduction, natural selection would long ago have favoured individuals who refrained from it. A Darwinian might be tempted to say the same of religion; hence the need for this discussion.

To an evolutionist, religious rituals 'stand out like peacocks in a sunlit glade' (Dan Dennett's phrase). Religious behaviour is a writ-large human equivalent of anting or bower-building. It is time-consuming, energy-consuming, often as extravagantly ornate as the plumage of a bird of paradise. Religion can endanger the life of the pious individual, as well as the lives of others. Thousands of people have been tortured for their loyalty to a religion, persecuted by zealots for what is in many cases a scarcely distinguishable alternative faith. Religion devours resources, sometimes on a massive scale. A medieval cathedral could consume a hundred man-centuries in its construction, yet was never used as a dwelling, or for any recognizably useful purpose. Was it some kind of architectural peacock's tail? If so, at whom was the advertisement aimed? Sacred music and devotional paintings largely monopolized medieval and Renaissance talent. Devout people have died for their gods and killed for them; whipped blood from their backs, sworn themselves to a lifetime of celibacy or to lonely silence, all in the service of religion. What is it all for? What is the benefit of religion?

By 'benefit', the Darwinian normally means some enhancement to the survival of the individual's genes. What is missing from this is the important point that Darwinian benefit is not restricted to the genes of the individual organism. There are three possible alternative targets of benefit. One arises from the theory of group selection, and I'll come to that. The second follows from the theory that I advocated in *The Extended Phenotype*: the individual you are watching may be working under the manipulative influence of genes in another individual, perhaps a parasite. Dan Dennett reminds us that the

common cold is universal to all human peoples in much the same way as religion is, yet we would not want to suggest that colds benefit us. Plenty of examples are known of animals manipulated into behaving in such a way as to benefit the transmission of a parasite to its next host. I encapsulated the point in my 'central theorem of the extended phenotype': 'An animal's behaviour tends to maximize the survival of the genes "for" that behaviour, whether or not those genes happen to be in the body of the particular animal performing it.'

Third, the 'central theorem' may substitute for 'genes' the more general term 'replicators'. The fact that religion is ubiquitous probably means that it has worked to the benefit of something, but it may not be us or our genes. It may be to the benefit of only the religious ideas themselves, to the extent that they behave in a somewhat gene-like way, as replicators. I shall deal with this below, under the heading 'Tread softly, because you tread on my memes'. Meanwhile, I press on with more traditional interpretations of Darwinism, in which 'benefit' is assumed to mean benefit to individual survival and reproduction.

Hunter-gatherer peoples such as Australian aboriginal tribes presumably live in something like the way our distant ancestors did. The New Zealand/Australian philosopher of science Kim Sterelny points up a dramatic contrast in their lives. On the one hand aboriginals are superb survivors under conditions that test their practical skills to the uttermost. But, Sterelny goes on, intelligent as our species might be, we are *perverse*ly intelligent. The very same peoples who are so savvy about the natural world and how to survive in it simultaneously clutter their minds with beliefs that are palpably false and for which the word 'useless' is a generous understatement. Sterelny himself is familiar with aboriginal peoples of Papua New Guinea. They survive under arduous conditions where food is hard to come by, by dint of a legendarily accurate understanding of their biological environment. But they combine this understanding with deep and destructive obsessions about female menstrual

pollution and about witchcraft. Many of the local cultures are tormented by fears of witchcraft and magic, and by the violence that accompanies those fears.' Sterelny challenges us to explain 'how we can be simultaneously so smart and so dumb'.⁷⁶

Though the details differ across the world, no known culture lacks some version of the time-consuming, wealth-consuming, hostility-provoking rituals, the anti-factual, counter-productive fantasies of religion. Some educated individuals may have abandoned religion, but all were brought up in a religious culture from which they usually had to make a conscious decision to depart. The old Northern Ireland joke, 'Yes, but are you a Protestant atheist or a Catholic atheist?', is spiked with bitter truth. Religious behaviour can be called a human universal in the same way as heterosexual behaviour can. Both generalizations allow individual exceptions, but all those exceptions understand only too well the rule from which they have departed. Universal features of a species demand a Darwinian explanation.

Obviously, there is no difficulty in explaining the Darwinian advantage of sexual behaviour. It is about making babies, even on those occasions where contraception or homosexuality seems to belie it. But what about religious behaviour? Why do humans fast, kneel, genuflect, self-flagellate, nod maniacally towards a wall, crusade, or otherwise indulge in costly practices that can consume life and, in extreme cases, terminate it?

DIRECT ADVANTAGES OF RELIGION

There is a little evidence that religious belief protects people from stress-related diseases. The evidence is not strong, but it would not be surprising if it were true, for the same kind of reason as faith-healing might turn out to work in a few cases. I wish it were not necessary to add that such beneficial effects in no way boost the truth value of religion's claims. In George Bernard Shaw's words, 'The fact that a believer is happier than a skeptic is no more to the point than the fact that a drunken man is happier than a sober one.'

Part of what a doctor can give a patient is consolation and reassurance. This is not to be dismissed out of hand. My doctor doesn't literally practise faith-healing by laying on of hands. But many's the time I've been instantly 'cured' of some minor ailment by a reassuring voice from an intelligent face surmounting a stethoscope. The placebo effect is well documented and not even very mysterious. Dummy pills, with no pharmacological activity at all, demonstrably improve health. That is why double-blind drug trials must use placebos as controls. It's why homeopathic remedies appear to work, even though they are so dilute that they have the same amount of active ingredient as the placebo control – zero molecules. Incidentally, an unfortunate by-product of the encroachment by lawyers on doctors' territory is that doctors are now afraid to prescribe placebos in normal practice. Or bureaucracy may oblige them to identify the placebo in written notes to which the patient has access, which of course defeats the object. Homeopaths may be achieving relative success because they, unlike orthodox practitioners, are still allowed to administer placebos – under another name. They also have more time to devote to talking and simply being kind to the patient. In the early part of its long history, moreover, homeopathy's reputation was inadvertently enhanced by the fact that its remedies did nothing at all – by contrast with orthodox medical practices, such as bloodletting, which did active harm.

Is religion a placebo that prolongs life by reducing stress? Possibly, although the theory must run a gauntlet of sceptics who point out the many circumstances in which religion causes rather than relieves stress. It is hard to believe, for example, that health is improved by the semi-permanent state of morbid guilt suffered by a Roman Catholic possessed of normal human frailty and less than normal intelligence. Perhaps it is unfair to single out the Catholics. The American comedian Cathy Ladman observes that 'All religions are the same: religion is basically guilt, with different holidays.' In any case, I find the placebo theory unworthy of the massively pervasive worldwide

phenomenon of religion. I don't think the reason we have religion is that it reduced the stress levels of our ancestors. That's not a big enough theory for the job, although it may have played a subsidiary role. Religion is a large phenomenon and it needs a large theory to explain it.

Other theories miss the point of Darwinian explanations altogether. I'm talking about suggestions like 'religion satisfies our curiosity about the universe and our place in it', or 'religion is consoling'. There may be some psychological truth here, as we shall see in Chapter 10, but neither is in itself a Darwinian explanation. As Steven Pinker pointedly said of the consolation theory, in *How the Mind Works*: 'it only raises the question of why a mind would evolve to find comfort in beliefs it can plainly see are false. A freezing person finds no comfort in believing he is warm; a person face-to-face with a lion is not put at ease by the conviction that it is a rabbit.' At the very least, the consolation theory needs to be translated into Darwinian terms, and that is harder than you might think. Psychological explanations to the effect that people find some belief agreeable or disagreeable are proximate, not ultimate, explanations.

Darwinians make much of this distinction between proximate and ultimate. The proximate explanation for the explosion in the cylinder of an internal combustion engine invokes the sparking plug. The ultimate explanation concerns the purpose for which the explosion was designed: to impel a piston from the cylinder, thereby turning a crankshaft. The proximate cause of religion might be hyperactivity in a particular node of the brain. I shall not pursue the neurological idea of a 'god centre' in the brain because I am not concerned here with proximate questions. That is not to belittle them. I recommend Michael Shermer's *How We Believe: The Search for God in an Age of Science* for a succinct discussion, which includes the suggestion by Michael Persinger and others that visionary religious experiences are related to temporal lobe epilepsy.

But my preoccupation in this chapter is with Darwinian

ultimate explanations. If neuroscientists find a 'god centre' in the brain, Darwinian scientists like me will still want to understand the natural selection pressure that favoured it. Why did those of our ancestors who had a genetic tendency to grow a god centre survive to have more grandchildren than rivals who didn't? The Darwinian ultimate question is not a better question, not a more profound question, not a more scientific question than the neurological proximate question. But it is the one I am talking about here.

Nor are Darwinians satisfied by political explanations, such as 'Religion is a tool used by the ruling class to subjugate the underclass.' It is surely true that black slaves in America were consoled by promises of another life, which blunted their dissatisfaction with this one and thereby benefited their owners. The question of whether religions are deliberately designed by cynical priests or rulers is an interesting one, to which historians should attend. But it is not, in itself, a Darwinian question. The Darwinian still wants to know why people are vulnerable to the charms of religion and therefore open to exploitation by priests, politicians and kings.

A cynical manipulator might use sexual lust as a tool of political power, but we still need the Darwinian explanation of why it works. In the case of sexual lust, the answer is easy: our brains are set up to enjoy sex because sex, in the natural state, makes babies. Or a political manipulator might use torture to achieve his ends. Once again, the Darwinian must supply the explanation for why torture is effective; why we will do almost anything to avoid intense pain. Again it seems obvious to the point of banality, but the Darwinian still needs to spell it out: natural selection has set up the perception of pain as a token of life-threatening bodily damage, and programmed us to avoid it. Those rare individuals who cannot feel pain, or don't care about it, usually die young of injuries which the rest of us would have taken steps to avoid. Whether it is cynically exploited, or whether it just manifests itself spontaneously, what ultimately explains the lust for gods?

GROUP SELECTION

Some alleged ultimate explanations turn out to be – or avowedly are – ‘group-selection’ theories. Group selection is the controversial idea that Darwinian selection chooses among species or other *groups* of individuals. The Cambridge archaeologist Colin Renfrew suggests that Christianity survived by a form of group selection because it fostered the idea of in-group loyalty and in-group brotherly love, and this helped religious groups to survive at the expense of less religious groups. The American group-selection apostle D. S. Wilson independently developed a similar suggestion at more length, in *Darwin's Cathedral*.

Here's an invented example, to show what a group-selection theory of religion might look like. A tribe with a stirringly belligerent 'god of battles' wins wars against rival tribes whose gods urge peace and harmony, or tribes with no gods at all. Warriors who unshakably believe that a martyr's death will send them straight to paradise fight bravely, and willingly give up their lives. So tribes with this kind of religion are more likely to survive in inter-tribal warfare, steal the conquered tribe's livestock and seize their women as concubines. Such successful tribes prolifically spawn daughter tribes that go off and propagate more daughter tribes, all worshipping the same tribal god. The idea of a group spawning daughter groups, like a beehive throwing off swarms, is not implausible, by the way. The anthropologist Napoleon Chagnon mapped just such fissioning of villages in his celebrated study of the 'Fierce People', the Yanomamö of the South American jungle.⁷

Chagnon is not a supporter of group selection, and nor am I. There are formidable objections to it. A partisan in the controversy, I must beware of riding off on my pet steed Tangent, far from the main track of this book. Some biologists betray a confusion between true group selection, as in my hypothetical example of the god of battles, and something else which they call group selection but which turns out on closer inspection to

be either kin selection or reciprocal altruism (see Chapter 6).

Those of us who belittle group selection admit that in principle it can happen. The question is whether it amounts to a significant force in evolution. When it is pitted against selection at lower levels – as when group selection is advanced as an explanation for individual self-sacrifice – lower-level selection is likely to be stronger. In our hypothetical tribe, imagine a single self-interested warrior in an army dominated by aspiring martyrs eager to die for the tribe and earn a heavenly reward. He will be only slightly less likely to end up on the winning side as a result of hanging back in the battle to save his own skin. The martyrdom of his comrades will benefit him more than it benefits each one of them on average, because they will be dead. He is more likely to reproduce than they are, and his genes for refusing to be martyred are more likely to be reproduced into the next generation. Hence tendencies towards martyrdom will decline in future generations.

This is a simplified toy example, but it illustrates a perennial problem with group selection. Group-selection theories of individual self-sacrifice are always vulnerable to subversion from within. Individual deaths and reproductions occur on a faster timescale and with greater frequency than group extinctions and fissionings. Mathematical models can be crafted to come up with special conditions under which group selection might be evolutionarily powerful. These special conditions are usually unrealistic in nature, but it can be argued that religions in human tribal groupings foster just such otherwise unrealistic special conditions. This is an interesting line of theory, but I shall not pursue it here except to concede that Darwin himself, though he was normally a staunch advocate of selection at the level of the individual organism, came as close as he ever came to group selectionism in his discussion of human tribes:

When two tribes of primeval man, living in the same country, came into competition, if the one tribe included (other circumstances being equal) a greater

number of courageous, sympathetic, and faithful members, who were always ready to warn each other of danger, to aid and defend each other, this tribe would without doubt succeed best and conquer the other . . . Selfish and contentious people will not cohere, and without coherence nothing can be effected. A tribe possessing the above qualities in a high degree would spread and be victorious over other tribes; but in the course of time it would, judging from all past history, be in turn overcome by some other and still more highly-endowed tribe.⁷⁸

To satisfy any biological specialists who might be reading this, I should add that Darwin's idea was not strictly group selection, in the true sense of successful groups spawning daughter groups whose frequency might be counted in a metapopulation of groups. Rather, Darwin visualized tribes with altruistically cooperative members spreading and becoming more numerous in terms of numbers of individuals. Darwin's model is more like the spread of the grey squirrel in Britain at the expense of the red: ecological replacement, not true group selection.

RELIGION AS A BY-PRODUCT OF SOMETHING ELSE

In any case, I want now to set aside group selection and turn to my own view of the Darwinian survival value of religion. I am one of an increasing number of biologists who see religion as a *by-product* of something else. More generally, I believe that we who speculate about Darwinian survival value need to 'think by-product'. When we ask about the survival value of anything, we may be asking the wrong question. We need to rewrite the question in a more helpful way. Perhaps the feature we are interested in (religion in this case) doesn't have a direct survival value of its own, but is a by-product of something else that

does. I find it helpful to introduce the by-product idea with an analogy from my own field of animal behaviour.

Moths fly into the candle flame, and it doesn't look like an accident. They go out of their way to make a burnt offering of themselves. We could label it 'self-immolation behaviour' and, under that provocative name, wonder how on earth natural selection could favour it. My point is that we must rewrite the question before we can even attempt an intelligent answer. It isn't suicide. Apparent suicide emerges as an inadvertent side-effect or by-product of something else. A by-product of . . . what? Well, here's one possibility, which will serve to make the point.

Artificial light is a recent arrival on the night scene. Until recently, the only night lights on view were the moon and the stars. They are at optical infinity, so rays coming from them are parallel. This fits them for use as compasses. Insects are known to use celestial objects such as the sun and the moon to steer accurately in a straight line, and they can use the same compass, with reversed sign, for returning home after a foray. The insect nervous system is adept at setting up a temporary rule of thumb of this kind: 'Steer a course such that the light rays hit your eye at an angle of 30 degrees.' Since insects have compound eyes (with straight tubes or light guides radiating out from the centre of the eye like the spines of a hedgehog), this might amount in practice to something as simple as keeping the light in one particular tube or ommatidium.

But the light compass relies critically on the celestial object being at optical infinity. If it isn't, the rays are not parallel but diverge like the spokes of a wheel. A nervous system applying a 30-degree (or any acute angle) rule of thumb to a nearby candle, as though it were the moon at optical infinity, will steer the moth, via a spiral trajectory, into the flame. Draw it out for yourself, using some particular acute angle such as 30 degrees, and you'll produce an elegant logarithmic spiral into the candle.

Though fatal in this particular circumstance, the moth's rule

of thumb is still, on average, a good one because, for a moth, sightings of candles are rare compared with sightings of the moon. We don't notice the hundreds of moths that are silently and effectively steering by the moon or a bright star, or even the glow from a distant city. We see only moths wheeling into our candle, and we ask the wrong question: Why are all these moths committing suicide? Instead, we should ask why they have nervous systems that steer by maintaining a fixed angle to light rays, a tactic that we notice only where it goes wrong. When the question is rephrased, the mystery evaporates. It never was right to call it suicide. It is a misfiring by-product of a normally useful compass.

Now, apply the by-product lesson to religious behaviour in humans. We observe large numbers of people – in many areas it amounts to 100 per cent – who hold beliefs that flatly contradict demonstrable scientific facts as well as rival religions followed by others. People not only hold these beliefs with passionate certitude, but devote time and resources to costly activities that flow from holding them. They die for them, or kill for them. We marvel at this, just as we marvelled at the 'self-immolation behaviour' of the moths. Baffled, we ask why. But my point is that we may be asking the wrong question. The religious behaviour may be a misfiring, an unfortunate by-product of an underlying psychological propensity which in other circumstances is, or once was, useful. On this view, the propensity that was naturally selected in our ancestors was not religion *per se*; it had some other benefit, and it only incidentally manifests itself as religious behaviour. We shall understand religious behaviour only after we have renamed it.

If, then, religion is a by-product of something else, what is that something else? What is the counterpart to the moth habit of navigating by celestial light compasses? What is the primitively advantageous trait that sometimes misfires to generate religion? I shall offer one suggestion by way of illustration, but I must stress that it is only an example of the

kind of thing I mean, and I shall come on to parallel suggestions made by others. I am much more wedded to the general principle that the question should be properly put, and if necessary rewritten, than I am to any particular answer.

My specific hypothesis is about children. More than any other species, we survive by the accumulated experience of previous generations, and that experience needs to be passed on to children for their protection and well-being. Theoretically, children might learn from personal experience not to go too near a cliff edge, not to eat untried red berries, not to swim in crocodile-infested waters. But, to say the least, there will be a selective advantage to child brains that possess the rule of thumb: believe, without question, whatever your grown-ups tell you. Obey your parents; obey the tribal elders, especially when they adopt a solemn, minatory tone. Trust your elders without question. This is a generally valuable rule for a child. But, as with the moths, it can go wrong.

I have never forgotten a horrifying sermon, preached in my school chapel when I was little. Horrifying in retrospect, that is: at the time, my child brain accepted it in the spirit intended by the preacher. He told us a story of a squad of soldiers, drilling beside a railway line. At a critical moment the drill sergeant's attention was distracted, and he failed to give the order to halt. The soldiers were so well schooled to obey orders without question that they carried on marching, right into the path of an oncoming train. Now, of course, I don't believe the story and I hope the preacher didn't either. But I believed it when I was nine, because I heard it from an adult in authority over me. And whether he believed it or not, the preacher wished us children to admire and model ourselves on the soldiers' slavish and unquestioning obedience to an order, however preposterous, from an authority figure. Speaking for myself, I think we *did* admire it. As an adult I find it almost impossible to credit that my childhood self wondered whether I would have had the courage to do my duty by marching under the train. But that, for what it is worth, is how I remember my feelings. The

sermon obviously made a deep impression on me, for I have remembered it and passed it on to you.

To be fair, I don't think the preacher thought he was serving up a religious message. It was probably more military than religious, in the spirit of Tennyson's 'Charge of the Light Brigade', which he may well have quoted:

'Forward the Light Brigade!'

Was there a man dismayed?

Not though the soldiers knew

Some one had blundered:

Theirs not to make reply,

Theirs not to reason why,

Theirs but to do and die:

Into the valley of Death

Rode the six hundred.

(One of the earliest and scratchiest recordings of the human voice ever made is of Lord Tennyson himself reading this poem, and the impression of hollow declaiming down a long, dark tunnel from the depths of the past seems eerily appropriate.) From the high command's point of view it would be madness to allow each individual soldier discretion over whether or not to obey orders. Nations whose infantrymen act on their own initiative rather than following orders will tend to lose wars. From the nation's point of view, this remains a good rule of thumb even if it sometimes leads to individual disasters. Soldiers are drilled to become as much like automata, or computers, as possible.

Computers do what they are told. They slavishly obey any instructions given in their own programming language. This is how they do useful things like word processing and spreadsheet calculations. But, as an inevitable by-product, they are equally robotic in obeying bad instructions. They have no way of telling whether an instruction will have a good effect or a bad. They simply obey, as soldiers are supposed to. It is their

unquestioning obedience that makes computers useful, and exactly the same thing makes them inescapably vulnerable to infection by software viruses and worms. A maliciously designed program that says, 'Copy me and send me to every address that you find on this hard disk' will simply be obeyed, and then obeyed again by the other computers down the line to which it is sent, in exponential expansion. It is difficult, perhaps impossible, to design a computer which is usefully obedient and at the same time immune to infection.

If I have done my softening-up work well, you will already have completed my argument about child brains and religion. Natural selection builds child brains with a tendency to believe whatever their parents and tribal elders tell them. Such trusting obedience is valuable for survival: the analogue of steering by the moon for a moth. But the flip side of trusting obedience is slavish gullibility. The inevitable by-product is vulnerability to infection by mind viruses. For excellent reasons related to Darwinian survival, child brains need to trust parents, and elders whom parents tell them to trust. An automatic consequence is that the truster has no way of distinguishing good advice from bad. The child cannot know that 'Don't paddle in the crocodile-infested Limpopo' is good advice but 'You must sacrifice a goat at the time of the full moon, otherwise the rains will fail' is at best a waste of time and goats. Both admonitions sound equally trustworthy. Both come from a respected source and are delivered with a solemn earnestness that commands respect and demands obedience. The same goes for positions about the world, about the cosmos, about morality and about human nature. And, very likely, when the child grows up and has children of her own, she will naturally pass the whole lot on to her own children — nonsense as well as sense — using the same infectious gravitas of manner.

On this model we should expect that, in different geographical regions, different arbitrary beliefs, none of which have any factual basis, will be handed down, to be believed with the same conviction as useful pieces of traditional wisdom such

as the belief that manure is good for the crops. We should also expect that superstitions and other non-factual beliefs will locally evolve – change over generations – either by random drift or by some sort of analogue of Darwinian selection, eventually showing a pattern of significant divergence from common ancestry. Languages drift apart from a common progenitor given sufficient time in geographical separation (I shall return to this point in a moment). The same seems to be true of baseless and arbitrary beliefs and injunctions, handed down the generations – beliefs that were perhaps given a fair wind by the useful programmability of the child brain.

Religious leaders are well aware of the vulnerability of the child brain, and the importance of getting the indoctrination in early. The Jesuit boast, 'Give me the child for his first seven years, and I'll give you the man,' is no less accurate (or sinister) for being hackneyed. In more recent times, James Dobson, founder of today's infamous 'Focus on the Family' movement,^{*} is equally acquainted with the principle: 'Those who control what young people are taught, and what they experience – what they see, hear, think, and believe – will determine the future course for the nation.'⁷⁹

But remember, my specific suggestion about the useful gullibility of the child mind is only an example of the *kind* of thing that might be the analogue of moths navigating by the moon or the stars. The ethologist Robert Hinde, in *Why Gods Persist*, and the anthropologists Pascal Boyer, in *Religion Explained*, and Scott Atran, in *In Gods We Trust*, have independently promoted the general idea of religion as a by-product of normal psychological dispositions – many by-products, I should say, for the anthropologists especially are concerned to emphasize the diversity of the world's religions as well as what they have in common. The findings of anthropologists seem

^{*} I was amused when I saw 'Focus on your own damn family' on a car bumper sticker in Colorado, but it now seems to me less funny. Maybe some children need to be protected from indoctrination by their own parents (see Chapter 9).

weird to us only because they are unfamiliar. All religious beliefs seem weird to those not brought up in them. Boyer did research on the Fang people of Cameroon, who believe . . .

. . . that witches have an extra internal animal-like organ that flies away at night and ruins other people's crops or poisons their blood. It is also said that these witches sometimes assemble for huge banquets, where they devour their victims and plan future attacks. Many will tell you that a friend of a friend actually saw witches flying over the village at night, sitting on a banana leaf and throwing magical darts at various unsuspecting victims.

Boyer continues with a personal anecdote:

I was mentioning these and other exoticia over dinner in a Cambridge college when one of our guests, a prominent Cambridge theologian, turned to me and said: 'That is what makes anthropology so fascinating and so difficult too. You have to explain *how people can believe such nonsense*.' Which left me dumbfounded. The conversation had moved on before I could find a pertinent response – to do with kettles and pots.

Assuming that the Cambridge theologian was a mainstream Christian, he probably believed some combination of the following:

- In the time of the ancestors, a man was born to a virgin mother with no biological father being involved.
- The same fatherless man called out to a friend called Lazarus, who had been dead long enough to stink, and Lazarus promptly came back to life.

- The fatherless man himself came alive after being dead and buried three days.
- Forty days later, the fatherless man went up to the top of a hill and then disappeared bodily into the sky.
- If you murmur thoughts privately in your head, the fatherless man, and his 'father' (who is also himself) will hear your thoughts and may act upon them. He is simultaneously able to hear the thoughts of everybody else in the world.
- If you do something bad, or something good, the same fatherless man sees all, even if nobody else does. You may be rewarded or punished accordingly, including after your death.
- The fatherless man's virgin mother never died but was 'assumed' bodily into heaven.
- Bread and wine, if blessed by a priest (who must have testicles), 'become' the body and blood of the fatherless man.

What would an objective anthropologist, coming fresh to this set of beliefs while on fieldwork in Cambridge, make of them?

PSYCHOLOGICALLY PRIMED FOR RELIGION

The idea of psychological by-products grows naturally out of the important and developing field of evolutionary psychology.⁸⁰ Evolutionary psychologists suggest that, just as the eye is an evolved organ for seeing, and the wing an evolved organ for flying, so the brain is a collection of organs (or 'modules') for dealing with a set of specialist data-processing needs. There is a module for dealing with kinship, a module for dealing with reciprocal exchanges, a module for dealing with

empathy, and so on. Religion can be seen as a by-product of the misfiring of several of these modules, for example the modules for forming theories of other minds, for forming coalitions, and for discriminating in favour of in-group members and against strangers. Any of these could serve as the human equivalent of the moths' celestial navigation, vulnerable to misfiring in the same kind of way as I suggested for childhood gullibility. The psychologist Paul Bloom, another advocate of the 'religion is a by-product' view, points out that children have a natural tendency towards a *dualistic* theory of mind. Religion, for him, is a by-product of such instinctive dualism. We humans, he suggests, and especially children, are natural born dualists.

A dualist acknowledges a fundamental distinction between matter and mind. A monist, by contrast, believes that mind is a manifestation of matter – material in a brain or perhaps a computer – and cannot exist apart from matter. A dualist believes the mind is some kind of disembodied spirit that *inhabits* the body and therefore conceivably could leave the body and exist somewhere else. Dualists readily interpret mental illness as 'possession by devils', those devils being spirits whose residence in the body is temporary, such that they might be 'cast out'. Dualists personify inanimate physical objects at the slightest opportunity, seeing spirits and demons even in water-falls and clouds.

F. Anstey's 1882 novel *Vice Versa* makes sense to a dualist, but strictly should be incomprehensible to a dyed-in-the-wool monist like me. Mr Bultitude and his son mysteriously find that they have swapped bodies. The father, much to the son's glee, is obliged to go to school in the son's body; while the son, in the father's body, almost ruins the father's business through his immature decisions. A similar plotline was used by P. G. Wodehouse in *Laughing Gas*, where the Earl of Havershot and a child movie star go under the anaesthetic at the same moment in neighbouring dentist's chairs, and wake up in each other's bodies. Once again, the plot makes sense only to a dualist. There has to be something corresponding to Lord Havershot

which is no part of his body, otherwise how could he wake up in the body of a child actor?

Like most scientists, I am not a dualist, but I am nevertheless easily capable of enjoying *Vice Versa* and *Laughing Gas*. Paul Bloom would say this is because, even though I have learned to be an intellectual monist, I am a human animal and therefore evolved as an instinctive dualist. The idea that there is a me perched somewhere behind my eyes and capable, at least in fiction, of migrating into somebody else's head, is deeply ingrained in me and in every other human being, whatever our intellectual pretensions to monism. Bloom supports his contention with experimental evidence that children are even more likely to be dualists than adults are, especially extremely young children. This suggests that a tendency to dualism is built into the brain and, according to Bloom, provides a natural predisposition to embrace religious ideas.

Bloom also suggests that we are innately predisposed to be creationists. Natural selection 'makes no intuitive sense'. Children are especially likely to assign purpose to everything, as the psychologist Deborah Keleman tells us in her article 'Are children "intuitive theists"?⁸¹ Clouds are 'for raining'. Pointy rocks are 'so that animals could scratch on them when they get itchy'. The assignment of purpose to everything is called teleology. Children are native teleologists, and many never grow out of it.

Native dualism and native teleology predispose us, given the right conditions, to religion, just as my moths' light-compass reaction predisposed them to inadvertent 'suicide'. Our innate dualism prepares us to believe in a 'soul' which inhabits the body rather than being integrally part of the body. Such a disembodied spirit can easily be imagined to move on somewhere else after the death of the body. We can also easily imagine the existence of a deity as pure spirit, not an emergent property of complex matter but existing independently of matter. Even more obviously, childish teleology sets us up for religion. If everything has a purpose, whose purpose is it? God's, of course.

But what is the counterpart of the *usefulness* of the moths' light compass? Why might natural selection have favoured dualism and teleology in the brains of our ancestors and their children? So far, my account of the 'innate dualists' theory has simply posited that humans are natural born dualists and teleologists. But what would the Darwinian advantage be? Predicting the behaviour of entities in our world is important for our survival, and we would expect natural selection to have shaped our brains to do it efficiently and fast. Might dualism and teleology serve us in this capacity? We may understand this hypothesis better in the light of what Daniel Dennett has called the intentional stance.

Dennett has offered a helpful three-way classification of the 'stances' that we adopt in trying to understand and hence predict the behaviour of entities such as animals, machines or each other.⁸² They are the physical stance, the design stance and the intentional stance. The *physical stance* always works in principle, because everything ultimately obeys the laws of physics. But working things out using the physical stance can be very slow. By the time we have sat down to calculate all the interactions of a complicated object's moving parts, our prediction of its behaviour will probably be too late. For an object that really is designed, like a washing machine or a crossbow, the *design stance* is an economical short cut. We can guess how the object will behave by going over the head of physics and appealing directly to design. As Dennett says,

Almost anyone can predict when an alarm clock will sound on the basis of the most casual inspection of its exterior. One does not know or care to know whether it is spring wound, battery driven, sunlight powered, made of brass wheels and jewel bearings or silicon chips – one just assumes that it is designed so that the alarm will sound when it is set to sound.

Living things are not designed, but Darwinian natural selection licenses a version of the design stance for them. We get a short cut to understanding the heart if we assume that it is 'designed' to pump blood. Karl von Frisch was led to investigate colour vision in bees (in the face of orthodox opinion that they were colour-blind) because he assumed that the bright colours of flowers were 'designed' to attract them. The quotation marks are designed to scare off mendacious creationists who might otherwise claim the great Austrian zoologist as one of their own. Needless to say, he was perfectly capable of translating the design stance into proper Darwinian terms.

The *intentional stance* is another short cut, and it goes one better than the design stance. An entity is assumed not merely to be designed for a purpose but to be, or contain, an *agent* with intentions that guide its actions. When you see a tiger, you had better not delay your prediction of its probable behaviour. Never mind the physics of its molecules, and never mind the design of its limbs, claws and teeth. That cat intends to eat you, and it will deploy its limbs, claws and teeth in flexible and resourceful ways to carry out its intention. The quickest way to second-guess its behaviour is to forget physics and physiology and cut to the intentional chase. Note that, just as the design stance works even for things that were not actually designed as well as things that were, so the intentional stance works for things that don't have deliberate conscious intentions as well as things that do.

It seems to me entirely plausible that the intentional stance has survival value as a brain mechanism that speeds up decision-making in dangerous circumstances, and in crucial social situations. It is less immediately clear that dualism is a necessary concomitant of the intentional stance. I shan't pursue the matter here, but I think a case could be developed that some kind of theory of other minds, which could fairly be described as dualistic, is likely to underlie the intentional stance – especially in complicated social situations, and even more especially where *higher-order* intentionality comes into play.

Dennett speaks of *third-order intentionality* (the man believed that the woman knew he wanted her), *fourth-order* (the woman realized that the man believed that the woman knew he wanted her) and even *fifth-order* intentionality (the shaman guessed that the woman realized that the man believed that the woman knew he wanted her). Very high orders of intentionality are probably confined to fiction, as satirized in Michael Frayn's hilarious novel *The Tin Men*: 'Watching Nunopoulos, Rick knew that he was almost certain that Anna felt a passionate contempt for Fiddlingchild's failure to understand her feelings about Fiddlingchild, and she knew too that Nina knew she knew about Nunopoulos's knowledge . . .' But the fact that we can laugh at such contortions of other-mind inference in fiction is probably telling us something important about the way our minds have been naturally selected to work in the real world.

In its lower orders at least, the intentional stance, like the design stance, saves time that might be vital to survival. Consequently, natural selection shaped brains to deploy the intentional stance as a short cut. We are biologically programmed to impute intentions to entities whose behaviour matters to us. Once again, Paul Bloom quotes experimental evidence that children are especially likely to adopt the intentional stance. When small babies see an object apparently following another object (for example, on a computer screen), they assume that they are witnessing an active chase by an intentional agent, and they demonstrate the fact by registering surprise when the putative agent fails to pursue the chase.

The design stance and the intentional stance are useful brain mechanisms, important for speeding up the second-guessing of entities that really matter for survival, such as predators or potential mates. But, like other brain mechanisms, these stances can misfire. Children, and primitive peoples, impute intentions to the weather, to waves and currents, to falling rocks. All of us are prone to do the same thing with machines, especially when they let us down. Many will remember with affection the day

Basil Fawly's car broke down during his vital mission to save Gourmet Night from disaster. He gave it fair warning, counted to three, then got out of the car, seized a tree branch and thrashed it to within an inch of its life. Most of us have been there, at least momentarily, with a computer if not with a car. Justin Barrett coined the acronym HADD, for hyperactive agent detection device. We hyperactively detect agents where there are none, and this makes us suspect malice or benignity where, in fact, nature is only indifferent. I catch myself momentarily harbouring savage resentment against some blameless inanimate such as my bicycle chain. There was a poignant recent report of a man who tripped over his untied shoelace in the Fitzwilliam Museum in Cambridge, fell down the stairs, and smashed three priceless Qing Dynasty vases: 'He landed in the middle of the vases and they splintered into a million pieces. He was still sitting there stunned when staff appeared. Everyone stood around in silence, as if in shock. The man kept pointing to his shoelace, saying, "There it is; that's the culprit."²⁸³

Other by-product explanations of religion have been proposed by Hinde, Shermer, Boyer, Atran, Bloom, Dennett, Keleman and others. One especially intriguing possibility mentioned by Dennett is that the irrationality of religion is a by-product of a particular built-in irrationality mechanism in the brain: our tendency, which presumably has genetic advantages, to fall in love.

The anthropologist Helen Fisher, in *Why We Love*, has beautifully expressed the insanity of romantic love, and how over-the-top it is compared with what might seem strictly necessary. Look at it this way. From the point of view of a man, say, it is unlikely that any one woman of his acquaintance is a hundred times more lovable than her nearest competitor, yet that is how he is likely to describe her when 'in love'. Rather than the fanatically monogamous devotion to which we are susceptible, some sort of 'polyamory' is on the face of it more rational. (Polyamory is the belief that one can simultaneously love several members of the opposite sex, just as one can love

more than one wine, composer, book or sport.) We happily accept that we can love more than one child, parent, sibling, teacher, friend or pet. When you think of it like that, isn't the total exclusiveness that we expect of spousal love positively weird? Yet it *is* what we expect, and it is what we set out to achieve. There must be a reason.

Helen Fisher and others have shown that being in love is accompanied by unique brain states, including the presence of neurally active chemicals (in effect, natural drugs) that are highly specific and characteristic of the state. Evolutionary psychologists agree with her that the irrational *coup de foudre* could be a mechanism to ensure loyalty to one co-parent, last-ing for long enough to rear a child together. From a Darwinian point of view it is, no doubt, important to choose a good partner, for all sorts of reasons. But, once having made a choice – even a poor one – and conceived a child, it is more important to stick with that one choice through thick and thin, at least until the child is weaned.

Could irrational religion be a by-product of the irrationality mechanisms that were originally built into the brain by selection for falling in love? Certainly, religious faith has something of the same character as falling in love (and both have many of the attributes of being high on an addictive drug*). The neuro-psychiatrist John Smythies cautions that there are significant differences between the brain areas activated by the two kinds of mania. Nevertheless, he notes some similarities too:

One facet of the many faces of religion is intense love focused on one supernatural person, i.e. God, plus reverence for icons of that person. Human life is driven largely by our selfish genes and by the processes of reinforcement. Much positive reinforcement derives from religion: warm and comforting

* See my exposé of the dangerous narcotic Gerin Oil: R. Dawkins, 'Gerin Oil', *Free Inquiry* 24: 1, 2003, 9–11.

feelings of being loved and protected in a dangerous world, loss of fear of death, help from the hills in response to prayer in difficult times, etc. Likewise, romantic love for another real person (usually of the other sex) exhibits the same intense concentration on the other and related positive reinforcements. These feelings can be triggered by icons of the other, such as letters, photographs, and even, as in Victorian times, locks of hair. The state of being in love has many physiological accompaniments, such as sighing like a furnace.⁸⁴

I made the comparison between falling in love and religion in 1993, when I noted that the symptoms of an individual infected by religion 'may be startlingly reminiscent of those more ordinarily associated with sexual love. This is an extremely potent force in the brain, and it is not surprising that some viruses have evolved to exploit it' ('viruses' here is a metaphor for religions: my article was called 'Viruses of the mind'). St Teresa of Avila's famously orgasmic vision is too notorious to need quoting again. More seriously, and on a less crudely sensual plane, the philosopher Anthony Kenny provides moving testimony to the pure delight that awaits those who manage to believe in the mystery of the transubstantiation. After describing his ordination as a Roman Catholic priest, empowered by laying on of hands to celebrate mass, he goes on that he vividly recalls

the exaltation of the first months during which I had the power to say Mass. Normally a slow and sluggish riser, I would leap early out of bed, fully awake and full of excitement at the thought of the momentous act I was privileged to perform . . .

It was touching the body of Christ, the closeness of the priest to Jesus, which most enthralled me. I would gaze on the Host after the words of con-

secration, soft-eyed like a lover looking into the eyes of his beloved . . . Those early days as a priest remain in my memory as days of fulfilment and tremulous happiness; something precious, and yet too fragile to last, like a romantic love-affair brought up short by the reality of an ill-assorted marriage.

The equivalent of the moth's light-compass reaction is the apparently irrational but useful habit of falling in love with one, and only one, member of the opposite sex. The misfiring by-product – equivalent to flying into the candle flame – is falling in love with Yahweh (or with the Virgin Mary, or with a wafer, or with Allah) and performing irrational acts motivated by such love.

The biologist Lewis Wolpert, in *Six Impossible Things Before Breakfast*, makes a suggestion that can be seen as a generalization of the idea of constructive irrationality. His point is that irrationally strong conviction is a guard against fickleness of mind: 'if beliefs that saved lives were not held strongly, it would have been disadvantageous in early human evolution. It would be a severe disadvantage, for example, when hunting or making tools, to keep changing one's mind.' The implication of Wolpert's argument is that, at least under some circumstances, it is better to persist in an irrational belief than to vacillate, even if new evidence or ratiocination favours a change. It is easy to see the 'falling in love' argument as a special case, and it is correspondingly easy to see Wolpert's 'irrational persistence' as yet another useful psychological predisposition that could explain important aspects of irrational religious behaviour: yet another by-product.

In his book *Social Evolution*, Robert Trivers enlarged on his 1976 evolutionary theory of self-deception. Self-deception is

hiding the truth from the conscious mind the better to hide it from others. In our own species we

recognize that shifty eyes, sweaty palms and croaky voices may indicate the stress that accompanies conscious knowledge of attempted deception. By becoming unconscious of its deception, the deceiver hides these signs from the observer. He or she can lie without the nervousness that accompanies deception.

The anthropologist Lionel Tiger says something similar in *Optimism: The Biology of Hope*. The connection to the sort of constructive irrationality we have just been discussing is seen in Trivers's paragraph about 'perceptual defense':

There is a tendency for humans consciously to see what they wish to see. They literally have difficulty seeing things with negative connotations while seeing with increasing ease items that are positive. For example, words that evoke anxiety, either because of an individual's personal history or because of experimental manipulation, require greater illumination before first being perceived.

The relevance of this to the wishful thinking of religion should need no spelling out.

The general theory of religion as an accidental by-product – a misfiring of something useful – is the one I wish to advocate. The details are various, complicated and disputable. For the sake of illustration, I shall continue to use my 'gullible child' theory as representative of 'by-product' theories in general. This theory – that the child brain is, for good reasons, vulnerable to infection by mental 'viruses' – will strike some readers as incomplete. Vulnerable the mind may be, but why should it be infected by *this* virus rather than that? Are some viruses especially proficient at infecting vulnerable minds? Why does 'infection' manifest itself as religion rather than as ... well, what? Part of what I want to say is that it doesn't matter what

particular style of nonsense infects the child brain. Once infected, the child will grow up and infect the next generation with the same nonsense, whatever it happens to be.

An anthropological survey such as Frazer's *Golden Bough* impresses us with the diversity of irrational human beliefs. Once entrenched in a culture they persist, evolve and diverge, in a manner reminiscent of biological evolution. Yet Frazer discerns certain general principles, for example 'homoeopathic magic', whereby spells and incantations borrow some symbolic aspect of the real-world object they are intended to influence. An instance with tragic consequences is the belief that powdered rhinoceros horn has aphrodisiac properties. Fatuous as it is, the legend stems from the horn's supposed resemblance to a virile penis. The fact that 'homoeopathic magic' is so widespread suggests that the nonsense that infects vulnerable brains is not entirely random, arbitrary nonsense.

It is tempting to pursue the biological analogy to the point of wondering whether something corresponding to natural selection is at work. Are some ideas more spreadable than others, because of intrinsic appeal or merit, or compatibility with existing psychological dispositions, and could this account for the nature and properties of actual religions as we see them, in something like the way we use natural selection to account for living organisms? It is important to understand that 'merit' here means only ability to survive and spread. It doesn't mean deserving of a positive value judgement – something of which we might be humanly proud.

Even on an evolutionary model, there doesn't have to be any natural selection. Biologists acknowledge that a gene may spread through a population not because it is a good gene but simply because it is a lucky one. We call this genetic drift. How important it is *vis-à-vis* natural selection has been controversial. But it is now widely accepted in the form of the so-called neutral theory of molecular genetics. If a gene mutates to a different version of itself which has an identical effect, the difference is neutral, and selection cannot favour

one or the other. Nevertheless, by what statisticians call sampling error over generations, the new mutant form can eventually replace the original form in the gene pool. This is a true evolutionary change at the molecular level (even if no change is observed in the world of whole organisms). It is a neutral evolutionary change that owes nothing to selective advantage.

The cultural equivalent of genetic drift is a persuasive option, one that we cannot neglect when thinking about the evolution of religion. Language evolves in a quasi-biological way and the direction its evolution takes looks undirected, pretty much like random drift. It is handed down by a cultural analogue of genetics, changing slowly over the centuries, until eventually various strands have diverged to the point of mutual unintelligibility. It is possible that some of the evolution of language is guided by a kind of natural selection, but that argument doesn't seem very persuasive. I'll explain below that some such idea has been proposed for major trends in language, such as the Great Vowel Shift which took place in English from the fifteenth to the eighteenth century. But such a functional hypothesis is not necessary to explain most of what we observe. It seems probable that language normally evolves by the cultural equivalent of random genetic drift. In different parts of Europe, Latin drifted to become Spanish, Portuguese, Italian, French, Romansche and the various dialects of these languages. It is, to say the least, not obvious that these evolutionary shifts reflect local advantages or 'selection pressures'.

I surmise that religions, like languages, evolve with sufficient randomness, from beginnings that are sufficiently arbitrary, to generate the bewildering – and sometimes dangerous – richness of diversity that we observe. At the same time, it is possible that a form of natural selection, coupled with the fundamental uniformity of human psychology, sees to it that the diverse religions share significant features in common. Many religions, for example, teach the objectively implausible but subjectively appealing doctrine that our personalities survive our bodily

death. The idea of immortality itself survives and spreads because it caters to wishful thinking. And wishful thinking counts, because human psychology has a near-universal tendency to let belief be coloured by desire ('Thy wish was father, Harry, to that thought', as Henry IV Part II said to his son*).

There seems to be no doubt that many of the attributes of religion are well fitted to helping the religion's own survival, and the survival of the attributes concerned, in the stew of human culture. The question now arises of whether the good fit is achieved by 'intelligent design' or by natural selection. The answer is probably both. On the side of design, religious leaders are fully capable of verbalizing the tricks that aid the survival of religion. Martin Luther was well aware that reason was religion's arch-enemy, and he frequently warned of its dangers: 'Reason is the greatest enemy that faith has; it never comes to the aid of spiritual things, but more frequently than not struggles against the divine Word, treating with contempt all that emanates from God.'²⁵ Again: 'Whoever wants to be a Christian should tear the eyes out of his reason.' And again: 'Reason should be destroyed in all Christians.' Luther would have had no difficulty in intelligently designing unintelligent aspects of a religion to help it survive. But that doesn't necessarily mean that he, or anyone else, did design it. It could also have evolved by a (non-genetic) form of natural selection, with Luther not its designer but a shrewd observer of its efficacy.

Even though conventional Darwinian selection of genes might have favoured psychological predispositions that produce religion as a by-product, it is unlikely to have shaped the details. I have already hinted that, if we are going to apply some form of selection theory to those details, we should look not to genes but to their cultural equivalents. Are religions such stuff as memes are made on?

* Not my joke: 1066 and All That.