

## Viruses of the mind

Richard Dawkins

In this provocative article the zoologist Richard Dawkins (1941- ) argues that religious beliefs are a kind of virus, not unlike a computer virus. They are parasitic on human beings, self-replicating, and extremely difficult to eradicate. Unlike scientific ideas, which are testable, precise and independent of cultural milieu, religious beliefs are usually untestable, imprecise and largely the product of a particular kind of upbringing. Religious faith is a kind of disease. The young need protection against it.

From *Dennett and His Critics*, edited by Bo Dahlbom

The haven all memes depend on reaching is the human mind, but a human mind is itself an artifact created when memes restructure a human brain in order to make it a better habitat for memes. The avenues for entry and departure are modified to suit local conditions, and strengthened by various artificial devices that enhance fidelity and prolixity of replication: native Chinese minds differ dramatically from native French minds, and literate minds differ from illiterate minds. What memes provide in return to the organisms in which they reside is an incalculable store of advantages — with some Trojan horses thrown in for good measure . . .

Daniel Dennett, *Consciousness Explained*

### 1 Duplication fodder

A beautiful child close to me, six and the apple of her father's eye, believes that Thomas the Tank Engine really exists. She believes in Father Christmas, and when she grows up her ambition is to be a tooth fairy. She and her schoolfriends believe the solemn word of respected adults that tooth fairies and Father Christmas really exist. This little girl is of an age

to believe whatever you tell her. If you tell her about witches changing princes into frogs she will believe you. If you tell her that bad children roast forever in hell she will have nightmares. I have just discovered that without her father's consent this sweet, trusting, gullible six-year-old is being sent, for weekly instruction, to a Roman Catholic nun. What chance has she?

A human child is shaped by evolution to soak up the culture of her people. Most obviously, she learns the essentials of their language in a matter of months. A large dictionary of words to speak, an encyclopedia of information to speak about, complicated syntactic and semantic rules to order the speaking, all are transferred from older brains into hers well before she reaches half her adult size. When you are preprogrammed to absorb useful information at a high rate, it is hard to shut out pernicious or damaging information at the same time. With so many mindbytes to be downloaded, so many mental codons to be duplicated, it is no wonder that child brains are gullible, open to almost any suggestion, vulnerable to subversion, easy prey to Moonies, scientists and nuns. Like immune-deficient patients, children are wide open to mental infections that adults might brush off without effort.

DNA, too, includes parasitic code. Cellular machinery is extremely good at copying DNA. Where DNA is concerned, it seems to have an eagerness to copy, like a child's eagerness to imitate the language of its parents. Concomitantly, DNA seems eager to be copied. The cell nucleus is a paradise for DNA, humming with sophisticated, fast, and accurate duplicating machinery.

Cellular machinery is so friendly towards DNA duplication that it is small wonder cells play host to DNA parasites — viruses, viroids, plasmids and a riff-raff of other genetic fellow travelers. Parasitic DNA even gets itself spliced seamlessly into the chromosomes themselves. 'Jumping genes' and stretches of 'selfish DNA' cut or copy themselves out of chromosomes and paste themselves in elsewhere. Deadly oncogenes are almost impossible to distinguish from the legitimate genes between which they are spliced. In evolutionary time, there is probably a continual traffic from 'straight' genes to 'outlaw', and back again (Dawkins 1982). DNA is just DNA. The only thing that distinguishes viral DNA from host DNA is its expected method of passing into future generations. 'Legitimate' host DNA is just DNA that aspires to pass into the next generation via the orthodox route of sperm or egg. 'Outlaw' or parasitic DNA is just DNA that looks to a quicker, less cooperative route to the future, via a sneezed droplet or a smear of blood, rather than via a sperm or egg.

For data on a floppy disc, a computer is a humming paradise just as cell nuclei hum with eagerness to duplicate DNA. Computers and their associated disc and tape readers are designed with high fidelity in mind.

As with DNA molecules, magnetized bytes don't literally 'want' to be faithfully copied. Nevertheless, you can write a computer program that takes steps to duplicate itself. Not just duplicate itself within one computer but spread itself to other computers. Computers are so good at copying bytes, and so good at faithfully obeying the instructions contained in those bytes, that they are sitting ducks to self-replicating programs: wide open to subversion by software parasites. Any cynic familiar with the theory of selfish genes and memes would have known that modern personal computers, with their promiscuous traffic of floppy disks and e-mail links, were just asking for trouble. The only surprising thing about the current epidemic of computer viruses is that it has been so long in coming.

## 2 Computer viruses: a model for an informational epidemiology

Computer viruses are pieces of code that graft themselves into existing, legitimate programs and subvert the normal actions of those programs.

DNA viruses and computer viruses spread for the same reason: an environment exists in which there is machinery well set up to duplicate and spread them around and to obey the instructions that the viruses embody. These two environments are, respectively, the environment of cellular physiology and the environment provided by a large community of computers and data-handling machinery. Are there any other environments like these, any other humming paradises of replication?

## 3 The infected mind

I have already alluded to the programmed-in gullibility of a child, so useful for learning language and traditional wisdom, and so easily subverted by nuns, Moonies and their ilk. More generally, we all exchange information with one another. We don't exactly plug floppy disks into slots in one another's skulls, but we exchange sentences, both through our ears and through our eyes. We notice each other's styles of moving and of dressing and are influenced. We take in advertising jingles, and are presumably persuaded by them, otherwise hard-headed businessmen would not spend so much money polluting the air with them.

Think about the two qualities that a virus, or any sort of parasitic replicator, demands of a friendly medium, the two qualities that make cellular machinery so friendly towards parasitic DNA, and that make computers so friendly towards computer viruses. These qualities are, firstly,

a readiness to replicate information accurately, perhaps with some mistakes that are subsequently reproduced accurately; and, secondly, a readiness to obey instructions encoded in the information so replicated.

Cellular machinery and electronic computers excel in both these virus-friendly qualities. How do human brains match up? As faithful duplicators, they are certainly less perfect than either cells or electronic computers. Nevertheless, they are still pretty good, perhaps about as faithful as an RNA virus, though not as good as DNA with all its elaborate proofreading measures against textual degradation. Evidence of the fidelity of brains, especially child brains, as data duplicators is provided by language itself. Shaw's Professor Higgins was able by ear alone to place Londoners in the street where they grew up. Fiction is not evidence for anything, but everyone knows that Higgins's fictional skill is only an exaggeration of something we can all do. Any American can tell Deep South from Mid West, New England from Hillbilly. Any New Yorker can tell Bronx from Brooklyn. Equivalent claims could be substantiated for any country. What this phenomenon means is that human brains are capable of pretty accurate copying (otherwise the accents of, say, Newcastle would not be stable enough to be recognized) but with some mistakes (otherwise pronunciation would not evolve, and all speakers of a language would inherit identically the same accents from their remote ancestors). Language evolves, because it has both the great stability and the slight changeability that are prerequisites for any evolving system.

The second requirement of a virus-friendly environment – that it should obey a program of coded instructions – is again only quantitatively less true for brains than for cells or computers. We sometimes obey orders from one another, but also we sometimes don't. Nevertheless, it is a telling fact that, the world over, the vast majority of children follow the religion of their parents rather than any of the other available religions. Instructions to genuflect, to bow towards Mecca, to nod one's head rhythmically towards the wall, to shake like a maniac, to 'speak in tongues' – the list of such arbitrary and pointless motor patterns offered by religion alone is extensive – are obeyed, if not slavishly, at least with some reasonably high statistical probability.

Less portentously, and again especially prominent in children, the 'craze' is a striking example of behavior that owes more to epidemiology than to rational choice. Yo-yos, hula hoops and pogo sticks, with their associated behavioral fixed actions, sweep through schools, and more sporadically leap from school to school, in patterns that differ from a measles epidemic in no serious particular. Ten years ago, you could have traveled thousands of miles through the United States and never seen a baseball cap turned back to front. Today, the reverse baseball cap is ubiquitous. I do not know what the pattern of geographical spread of the reverse baseball cap precisely was, but epidemiology is certainly among

nevertheless, he feels as totally compelling and convincing. We doctors refer to such a belief as 'faith.'

- (2) Patients typically make a positive virtue of faith's being strong and unshakable, *in spite of* not being based upon evidence. Indeed, they may feel that the less evidence there is, the more virtuous the belief (see below).

This paradoxical idea that lack of evidence is a positive virtue where faith is concerned has something of the quality of a program that is self-sustaining, because it is self-referential (see the chapter, 'On viral sentences and self-replicating structures' in Hofstadter, 1985). Once the proposition is believed, it automatically undermines opposition to itself. The 'lack of evidence is a virtue' idea would be an admirable sidekick, ganging up with faith itself in a clique of mutually supportive viral programs.

- (3) A related symptom, which a faith-sufferer may also present, is the conviction that 'mystery,' *per se*, is a good thing. It is not a virtue to solve mysteries. Rather we should enjoy them, even revel in their insolubility.

Any impulse to solve mysteries could be seriously inimical to the spread of a mind virus. It would not, therefore, be surprising if the idea that 'mysteries are better not solved' was a favored member of a mutually supporting gang of viruses. Take the 'Mystery of the Transubstantiation.' It is easy and non-mysterious to believe that in some symbolic or metaphorical sense the eucharistic wine turns into the blood of Christ. The Roman Catholic doctrine of transubstantiation, however, claims far more. The 'whole substance' of the wine is converted into the blood of Christ; the appearance of wine that remains is 'merely accidental,' 'inhering in no substance' (Kenny 1986, p. 72). Transubstantiation is colloquially taught as meaning that the wine 'literally' turns into the blood of Christ. Whether in its obfuscatory Aristotelian or its franker colloquial form, the claim of transubstantiation can be made only if we do serious violence to the normal meanings of words like 'substance' and 'literally.' Redefining words is not a sin but, if we use words like 'whole substance' and 'literally' for this case, what word are we going to use when we really and truly want to say that something did actually happen? As Anthony Kenny observed of his own puzzlement as a young seminarian, 'For all I could tell, my typewriter might be Benjamin Disraeli transubstantiated. . . .'

Roman Catholics, whose belief in infallible authority compels them to accept that wine becomes physically transformed into blood despite all appearances, refer to the 'mystery' of the transubstantiation. Calling it a mystery makes everything OK, you see. At least, it works for a mind well

the professions primarily qualified to study it. We don't have to get into arguments about 'determinism;' we don't have to claim that children are compelled to imitate their fellows' hat fashions. It is enough that their hat-wearing behavior, as a matter of fact, is statistically affected by the hat-wearing behavior of their fellows.

Trivial though they are, crazes provide us with yet more circumstantial evidence that human minds, especially perhaps juvenile ones, have the qualities that we have singled out as desirable for an informational parasite. At the very least the mind is a plausible *candidate* for infection by something like a computer virus, even if it is not quite such a parasite's dream-environment as a cell nucleus or an electronic computer.

It is intriguing to wonder what it might feel like, from the inside, if one's mind were the victim of a 'virus.' This might be a deliberately designed parasite, like a present-day computer virus. Or it might be an inadvertently mutated and unconsciously evolved parasite. Either way, especially if the evolved parasite was the memic descendant of a long line of successful ancestors, we are entitled to expect the typical 'mind virus' to be pretty good at its job of getting itself successfully replicated.

Progressive evolution of more effective mind-parasites will have two aspects. New 'mutants' (either random or designed by humans) that are better at spreading will become more numerous. And there will be a ganging up of ideas that flourish in one another's presence, ideas that mutually support one another just as genes do and as I have speculated computer viruses may one day do. We expect that replicators will go around together from brain to brain in mutually compatible gangs. These gangs will come to constitute a package, which may be sufficiently stable to deserve a collective name such as Roman Catholicism or Voodoo. It doesn't too much matter whether we analogize the whole package to a single virus, or each one of the component parts to a single virus. The analogy is not that precise anyway, just as the distinction between a computer virus and a computer worm is nothing to get worked up about. What matters is that minds are friendly environments to parasitic, self-replicating ideas or information, and that minds are typically massively infected.

Like computer viruses, successful mind viruses will tend to be hard for their victims to detect. If you are the victim of one, the chances are that you won't know it, and may even vigorously deny it. Accepting that a virus might be difficult to detect in your own mind, what tell-tale signs might you look out for? I shall answer by imagining how a medical textbook might describe the typical symptoms of a sufferer (arbitrarily assumed to be male).

- (1) The patient typically finds himself impelled by some deep, inner conviction that something is true, or right, or virtuous: a conviction that doesn't seem to owe anything to evidence or reason, but which,

prepared by background infection. Exactly the same trick is performed in the 'mystery' of the Trinity. Mysteries are not meant to be solved, they are meant to strike awe. The 'mystery is a virtue' idea comes to the aid of the Catholic, who would otherwise find intolerable the obligation to believe the obvious nonsense of the transubstantiation and the 'three-in-one.' Again, the belief that 'mystery is a virtue' has a self-referential ring. As Hofstadter might put it, the very mysteriousness of the belief moves the believer to perpetuate the mystery.

An extreme symptom of 'mystery is a virtue' infection is Tertullian's '*Certum est quia impossibile est*' ('It is certain because it is impossible'). That way madness lies. One is tempted to quote Lewis Carroll's White Queen who, in response to Alice's 'One can't believe impossible things' retorted 'I daresay you haven't had much practice . . . When I was your age, I always did it for half-an-hour a day. Why, sometimes I've believed as many as six impossible things before breakfast.' Or Douglas Adams's Electric Monk, a labor-saving device programmed to do your believing for you, which was capable of 'believing things they'd have difficulty believing in Salt Lake City' and which, at the moment of being introduced to the reader, believed, contrary to all the evidence, that everything in the world was a uniform shade of pink. But White Queens and Electric Monks become less funny when you realize that these virtuosos believers are indistinguishable from revered theologians in real life. 'It is by all means to be believed, because it is absurd' (Tertullian again). Sir Thomas Browne (1635) quotes Tertullian with approval, and goes further: 'Methinks there be not impossibilities enough in religion for an active faith.' And 'I desire to exercise my faith in the difficultest point; for to credit ordinary and visible objects is not faith, but perswasion.'

I have the feeling that something more interesting is going on here than just plain insanity or surrealist nonsense, something akin to the admiration we feel when we watch a ten-ball juggler on a tightrope. It is as though the faithful gain prestige through managing to believe even more ridiculous things than their rivals succeed in believing. Are these people testing - exercising - their believing muscles, training themselves to believe impossible things so that they can take in their stride the merely improbable things that they are ordinarily called upon to believe?

While I was writing this, the *Guardian* (July 29, 1991) fortuitously carried a beautiful example. It came in an interview with a rabbi undertaking the bizarre task of vetting the kosher-purity of food products right back to the ultimate origins of their minutest ingredients. He was currently agonizing over whether to go all the way to China to scrutinize the menthol that goes into cough sweets. 'Have you ever tried checking Chinese menthol . . . it was extremely difficult, especially since the first letter we sent received the reply in best Chinese English, 'The product contains no kosher' . . . China has only recently started opening up to kosher investigators. The

menthol should be OK, but you can never be absolutely sure unless you visit.' These kosher investigators run a telephone hotline on which up-to-the-minute red-alerts of suspicion are recorded against chocolate bars and cod-liver oil. The rabbi sighs that the green-inspired trend away from artificial colors and flavors 'makes life miserable in the kosher field because you have to follow all these things back.' When the interviewer asks him why he bothers with this obviously pointless exercise, he makes it very clear that the point is precisely that there is no point.

That most of the Kashrut laws are divine ordinances without reason given is 100 per cent the point. It is very easy not to murder people. Very easy. It is a little bit harder not to steal because one is tempted occasionally. So that is no great proof that I believe in God or am fulfilling His will. But, if He tells me not to have a cup of coffee with milk in it with my mince meat and peas at lunchtime, that is a test. The only reason I am doing that is because I have been told to so do. It is doing something difficult.

Helena Cronin has suggested to me that there may be an analogy here to Zahavi's handicap theory of sexual selection and the evolution of signals (Zahavi 1975). Long unfashionable, even ridiculed (Dawkins 1976), Zahavi's theory has recently been cleverly rehabilitated (Grafen 1990a, 1990b) and is now taken seriously by evolutionary biologists (Dawkins 1989). Zahavi suggests that peacocks, for instance, evolve their absurdly burdensome fans with their ridiculously conspicuous (to predators) colors, precisely *because* they are burdensome and dangerous, and therefore impressive to females. The peacock is, in effect, saying: 'Look how fit and strong I must be, since I can afford to carry around this preposterous tail.'

To avoid misunderstanding of the subjective language in which Zahavi likes to make his points, I should add that the biologist's convention of personifying the unconscious actions of natural selection is taken for granted here. Grafen has translated the argument into an orthodox Darwinian mathematical model, and it works. No claim is here being made about the intentionality or awareness of peacocks and peahens. They can be as sphexish or as intentional as you please (Dennett 1983, 1984). Moreover, Zahavi's theory is general enough not to depend upon a Darwinian underpinning. A flower advertising its nectar to a 'skeptical' bee could benefit from the Zahavi principle. But so could a human salesman seeking to impress a client.

The premise of Zahavi's idea is that natural selection will favor skepticism among females (or among recipients of advertising messages generally). The only way for a male (or any advertiser) to authenticate his boast of strength (quality, or whatever it is) is to prove that it is true by

shouldering a truly costly handicap – a handicap *that only a genuinely strong* (high-quality, etc.) male could bear. It may be called the principle of costly authentication. And now to the point. Is it possible that some religious doctrines are favored not *in spite of* being ridiculous but precisely *because* they are ridiculous? Any wimp in religion could believe that bread *symbolically* represents the body of Christ, but it takes a real, red-blooded Catholic to believe something as daft as the transubstantiation. If you can believe that you can believe anything, and (witness the story of Doubting Thomas) these people are trained to see that as a virtue.

Let us return to our list of symptoms that someone afflicted with the mental virus of faith, and its accompanying gang of secondary infections, may expect to experience.

(4) The sufferer may find himself behaving intolerantly towards vectors of rival faiths, in extreme cases even killing them or advocating their deaths. He may be similarly violent in his disposition towards apostates (people who once held the faith but have renounced it); or towards heretics (people who espouse a different – often, perhaps significantly, only very slightly different – version of the faith). He may also feel hostile towards other modes of thought that are potentially inimical to his faith, such as the method of scientific reason which may function rather like a piece of anti-viral software.

The threat to kill the distinguished novelist Salman Rushdie is only the latest in a long line of sad examples. On the very day that I wrote this, the Japanese translator of *The Satanic Verses* was found murdered, a week after a near-fatal attack on the Italian translator of the same book. By the way, the apparently opposite symptom of ‘sympathy’ for Muslim ‘hurt,’ voiced by the Archbishop of Canterbury and other Christian leaders (verging, in the case of the Vatican, on outright criminal complicity) is, of course, a manifestation of the symptom we diagnosed earlier: the delusion that faith, however obnoxious its results, has to be respected simply because *it is* faith.

Murder is an extreme, of course. But there is an even more extreme symptom, and that is suicide in the militant service of a faith. Like a soldier ant programmed to sacrifice her life for germ-line copies of the genes that did the programming, a young Arab or Japanese is taught that to die in a holy war is the quickest way to heaven. Whether the leaders who exploit him really believe this does not diminish the brutal power that the ‘suicide mission virus’ wields on behalf of the faith. Of course suicide, like murder, is a mixed blessing: would-be converts may be repelled, or may treat with contempt a faith that is perceived as insecure enough to need such tactics.

More obviously, if too many individuals sacrifice themselves the supply of believers could run low. This was true of a notorious example

of faith-inspired suicide, though in this case it was not ‘kamikaze’ death in battle. The Peoples’ Temple sect became extinct when its leader, the Reverend Jim Jones, led the bulk of his followers from the United States to the Promised Land of ‘Jonestown’ in the Guyanan jungle where he persuaded more than 900 of them, children first, to drink cyanide. The macabre affair was fully investigated by a team from the *San Francisco Chronicle* (Kilduff and Javers 1978).

Jones, ‘the Father,’ had called his flock together and told them it was time to depart for heaven.

‘We’re going to meet,’ he promised, ‘in another place.’

The words kept coming over the camp’s loudspeakers.

‘There is great dignity in dying. It is a great demonstration for everyone to die.’

Incidentally, it does not escape the trained mind of the alert sociobiologist that Jones, within his sect in earlier days, ‘proclaimed himself the only person permitted to have sex’ (presumably his partners were also permitted). ‘A secretary would arrange for Jones’s liaisons. She would call up and say, “Father hates to do this, but he has this tremendous urge and could you please . . .?”’ His victims were not only female. One 17-year-old male follower, from the days when Jones’s community was still in San Francisco, told how he was taken for dirty weekends to a hotel where Jones received a ‘minister’s discount for Rev. Jim Jones and son.’ The same boy said: ‘I was really in awe of him. He was more than a father. I would have killed my parents for him.’ What is remarkable about the Reverend Jim Jones is not his own self-serving behavior but the almost superhuman gullibility of his followers. Given such prodigious credulity, can anyone doubt that human minds are ripe for malignant infection?

Admittedly, the Reverend Jones conned only a few thousand people. But his case is an extreme, the tip of an iceberg. The same eagerness to be conned by religious leaders is widespread. Most of us would have been prepared to bet that nobody could get away with going on television and saying, in all but so many words, ‘Send me your money, so that I can use it to persuade other suckers to send me their money too.’ Yet today, in every major conurbation in the United States, you can find at least one television evangelist channel entirely devoted to this transparent confidence trick. And they get away with it in sackfuls. Faced with suckerdom on this awesome scale, it is hard not to feel a grudging sympathy with the shunned suited comen. Until you realize that not all the suckers are rich, and that it is often widows’ mites on which the evangelists are growing fat. I have even heard one of them explicitly invoking the principle that I now identify with Zahavi’s principle of costly authentication. God really appreciates a donation, he said with passionate sincerity, only when that donation is

so large that it hurts. Elderly paupers were wheeled on to testify how much happier they felt since they had made over their little all to the Reverend whoever it was.

(5) The patient may notice that the particular convictions that he holds, while having nothing to do with evidence, do seem to owe a great deal to epidemiology. Why, he may wonder, do I hold *this* set of convictions rather than *that* set? Is it because I surveyed all the world's faiths and chose the one whose claims seemed most convincing? Almost certainly not. If you have a faith, it is statistically overwhelmingly likely that it is the same faith as your parents and grandparents had. No doubt soaring cathedrals, stirring music, and moving stories and parables, help a bit. But by far the most important variable determining your religion is the accident of birth. The convictions that you so passionately believe would have been a completely different, and largely contradictory, set of convictions, if only you had happened to be born in a different place. Epidemiology, if not evidence.

(6) If the patient is one of the rare exceptions who follows a different religion from his parents, the explanation may still be epidemiological. To be sure, it is *possible* that he dispassionately surveyed the world's faiths and chose the most convincing one. But it is statistically more probable that he has been exposed to a particularly potent infective agent — a John Wesley, a Jim Jones or a St Paul. Here we are talking about horizontal transmission, as in measles. Before, the epidemiology was that of vertical transmission, as in Huntington's Chorea.

(7) The internal sensations of the patient 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. 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 that 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. I rarely said the public Community Mass: most days I celebrated alone at a side altar with a junior member of the College to serve as acolyte and congregation. But that made no difference to the solemnity of the sacrifice or the validity of the consecration.

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 consecration, 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 tremendous 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.

(Kenny 1986: 101–2)

Dr Kenny is affectingly believable that it felt to him, as a young priest, as though he was in love with the consecrated host. What a brilliantly successful virus! On the same page, incidentally, Kenny also shows us that the virus is transmitted contagiously — if not literally then at least in some sense — from the palm of the infecting bishop's hand through the top of the new priest's head:

If Catholic doctrine is true, every priest validly ordained derives his orders in an unbroken line of laying on of hands, through the bishop who ordains him, back to one of the twelve Apostles . . . there must be centuries-long, recorded chains of layings on of hands. It surprises me that priests never seem to trouble to trace their spiritual ancestry in this way, finding out who ordained their bishop, and who ordained him, and so on to Julius II or Celestine V or Hildebrand, or Gregory the Great, perhaps.

(Kenny 1986: 101)

It surprises me, too.

#### 4 Is science a virus?

No. Not unless all computer programs are viruses. Good, useful programs spread because people evaluate them, recommend them and pass them on. Computer viruses spread solely because they embody the coded instructions: 'Spread me.' Scientific ideas, like all memes, are subject to a kind of natural selection, and this might look superficially virus-like. But the selective forces that scrutinize scientific ideas are not arbitrary or

capricious. They are exacting, well-honed rules, and they do not favor pointless self-serving behavior. They favor all the virtues laid out in textbooks of standard methodology: testability, evidential support, precision, quantifiability, consistency, intersubjectivity, repeatability, universality, progressiveness, independence of cultural milieu, and so on. Faith spreads despite a total lack of every single one of these virtues.

You may find elements of epidemiology in the spread of scientific ideas, but it will be largely descriptive epidemiology. The rapid spread of a good idea through the scientific community may even look like a description of a measles epidemic. But when you examine the underlying reasons you find that they are good ones, satisfying the demanding standards of scientific method. In the history of the spread of faith you will find little else but epidemiology, and causal epidemiology at that. The reason why person *A* believes one thing and *B* believes another is simply and solely that *A* was born on one continent and *B* on another. Testability, evidential support and the rest aren't even remotely considered. For scientific belief, epidemiology merely comes along afterwards and describes the history of its acceptance. For religious belief, epidemiology is the root cause.

## 5 Epilogue

Happily, viruses don't win every time. Many children emerge unscathed from the worst that nuns and mullahs can throw at them. Anthony Kenny's own story has a happy ending. He eventually renounced his orders because he could no longer tolerate the obvious contradictions within Catholic belief, and he is now a highly respected scholar. But one cannot help remarking that it must be a powerful infection indeed that took a man of his wisdom and intelligence — now President of the British Academy, no less — three decades to fight off. Am I unduly alarmist to fear for the soul of my six-year-old innocent?

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