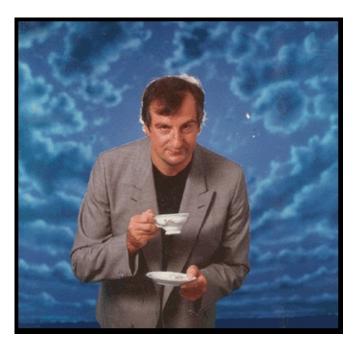# Is there an Artificial God?

Douglas Adams' speech at [Digital Biota 2](#), Cambridge U.K. September 1998

In honour of Douglas' memory, Biota.org presents the transcript of his speech at Digital Biota 2, held at Magdelene College Cambridge, in September 1998. I would like to thank Steve Grand for providing this to us. Douglas presented this "off the cuff" which only magifies his true genius in our eyes. -- Bruce Damer

This was originally billed as a debate only because I was a bit anxious coming here. I didn't think I was going to have time to prepare anything and also, in a room full of such luminaries, I thought 'what could I, as an amateur, possibly have to say'? So I thought I would settle for a debate. But after having been here for a couple of days, I realised you're just a bunch of guys! It's been rife with ideas and I've had so many myself through talking with and listening to people that I'd thought what I'd do was stand up and have an argument and debate with myself. I'll talk for a while and hope sufficiently to provoke and inflame opinion that there'll be an outburst of chair- throwing at the end.

Before I embark on what I want to try and tackle, may I warn you that things may get a little bit lost from time to time, because there's a lot of stuff that's just come in from what we've been hearing today, so if I occasionally sort of go… I was telling somebody earlier today that I have a four-year-old daughter and was very, very interested watching her face

when she was in her first 2 or 3 weeks of life and suddenly realising what nobody would have realised in previous ages—she was rebooting!

I just want to mention one thing, which is completely meaningless, but I am terribly proud of—I was born in Cambridge in 1952 and my initials are D N A!

The topic I want to introduce to you this evening, the subject of the debate that we are about to sort of not have, is a slightly facetious one (you'll be surprised to hear, but we'll see where we go with it)—"*Is there an Artificial God?*" I'm sure most of the people in this room will share the same view, but even as an out-and-out atheist one can't help noticing that the rôle of a god has had an enormously profound impact on human history over many, many centuries. It's very interesting to figure out where this came from and what, in the modern scientific world we sometimes hope against hope that we live in, it actually means.

I was thinking about this earlier today when Larry Yaeger was talking about 'what is life?' and mentioned at the end something I didn't know, about a special field of handwriting recognition. The following strange thought went through my mind: that trying to figure out what is life and what isn't and where the boundary is has an interesting relationship with how you recognise handwriting. We all know, when presented with any particular entity, whether it's a bit of mould from the fridge or whatever; we instinctively know when something is an example of life and when it isn't. But it turns out to be tremendously hard exactly to define it. I remember once, a long time ago, needing a definition of life for a speech I was giving. Assuming there was a simple one and looking around the Internet, I was astonished at how diverse the definitions were and how very, very detailed each one had to be in order to include 'this' but not include 'that'. If you think about it, a collection that includes a fruit fly and Richard Dawkins and the Great Barrier Reef is an awkward set of objects to try and compare. When we try and figure out what the rules are that we are looking for, trying to find a rule that's self-evidently true, that turns out to be very, very hard.

Compare this with the business of recognising whether something is an A or a B or a C. It's a similar kind of process, but it's also a very, very different process, because you may say of something that you're 'not quite

certain whether it counts as life or not life, it's kind of there on the edge isn't it, it's probably a very low example of what you might call life, it's maybe just about alive or maybe it isn't'. Or maybe you might say about something that's an example of Digital life, 'does that count as being alive?' Is it something, to coin someone's earlier phrase, that'll go squish if you step on it? Think about the controversial Gaia hypothesis; people say 'is the planet alive?', 'is the ecosphere alive or not?' In the end it depends on how you define such things.

Compare that with handwriting recognition. In the end you are trying to say "is this an A or is it a B?" People write As and Bs in many different ways; floridly, sloppily or whatever. It's no good saying 'well, it's sort of A-ish but there's a bit of B in there', because you can't write the word 'apple' with such a thing. It is either an A or a B. How do you judge? If you're doing handwriting recognition, what you are trying to do is not to assess the relative degrees of A-ness or B-ness of the letter, but trying to define the intention of the person who wrote it. It's very clear in the end—is it an A or a B?—ah! it's an A, because the person writing it was writing the word apple and that's clearly what it means. So, in the end, in the absence of an intentional creator, you cannot say what life is, because it simply depends on what set of definitions you include in your overall definition. Without a god, life is only a matter of opinion.

I want to pick up on a few other things that came around today. I was fascinated by Larry (again), talking about tautology, because there's an argument that I remember being stumped by once, to which I couldn't come up with a reply, because I was so puzzled by the challenge and couldn't quite figure it out. A guy said to me, 'yes, but the whole theory of evolution is based on a tautology: that which survives, survives' This is tautological, therefore it doesn't mean anything. I thought about that for a while and it finally occurred to me that a tautology is something that if it means nothing, not only that no information has gone into it but that no consequence has come out of it. So, we may have accidentally stumbled upon the ultimate answer; it's the only thing, the only force, arguably the most powerful of which we are aware, which requires no other input, no other support from any other place, is self evident, hence tautological, but nevertheless astonishingly powerful in its effects. It's hard to find anything that corresponds to that and I therefore put it at the beginning of one of my books. I reduced it to what I thought were the bare essentials, which are

very similar to the ones you came up with earlier, which were "*anything that happens happens, anything that in happening causes something else to happen causes something else to happen and anything that in happening causes itself to happen again, happens again*". In fact you don't even need the second two because they flow from the first one, which is self-evident and there's nothing else you need to say; everything else flows from that. So, I think we have in our grasp here a fundamental, ultimate truth, against which there is no gain-saying. It was spotted by the guy who said this is a tautology. Yes, it is, but it's a unique tautology in that it requires no information to go in but an infinite amount of information comes out of it. So I think that it is arguably therefore the prime cause of everything in the Universe. Big claim, but I feel I'm talking to a sympathetic audience.

Where does the idea of God come from? Well, I think we have a very skewed point of view on an awful lot of things, but let's try and see where our point of view comes from. Imagine early man. Early man is, like everything else, an evolved creature and he finds himself in a world that he's begun to take a little charge of; he's begun to be a tool-maker, a changer of his environment with the tools that he's made and he makes tools, when he does, in order to make changes in his environment. To give an example of the way man operates compared to other animals, consider speciation, which, as we know, tends to occur when a small group of animals gets separated from the rest of the herd by some geological upheaval, population pressure, food shortage or whatever and finds itself in a new environment with maybe something different going on. Take a very simple example; maybe a bunch of animals suddenly finds itself in a place where the weather is rather colder. We know that in a few generations those genes which favour a thicker coat will have come to the fore and we'll come and we'll find that the animals have now got thicker coats. Early man, who's a tool maker, doesn't have to do this: he can inhabit an extraordinarily wide range of habitats on earth, from tundra to the Gobi Desert—he even manages to live in New York for heaven's sake— and the reason is that when he arrives in a new environment he doesn't have to wait for several generations; if he arrives in a colder environment and sees an animal that has those genes which favour a thicker coat, he says "I'll have it off him". Tools have enabled us to think intentionally, to make things and to do things to create a world that fits us better. Now imagine an early man surveying his surroundings at the end of a happy day's tool making. He looks around and he sees a world which pleases him

mightily: behind him are mountains with caves in—mountains are great because you can go and hide in the caves and you are out of the rain and the bears can't get you; in front of him there's the forest—it's got nuts and berries and delicious food; there's a stream going by, which is full of water—water's delicious to drink, you can float your boats in it and do all sorts of stuff with it; here's cousin Ug and he's caught a mammoth—mammoth's are great, you can eat them, you can wear their coats, you can use their bones to create weapons to catch other mammoths. I mean this is a *great* world, it's fantastic. But our early man has a moment to reflect and he thinks to himself, 'well, this *is* an interesting world that I find myself in' and then he asks himself a very treacherous question, a question which is totally meaningless and fallacious, but only comes about because of the nature of the sort of person he is, the sort of person he has evolved into and the sort of person who has thrived because he thinks this particular way. Man the maker looks at his world and says 'So who made this then?' Who made this? — you can see why it's a treacherous question. Early man thinks, 'Well, because there's only one sort of being I know about who makes things, whoever made all this must therefore be a much bigger, much more powerful and necessarily invisible, one of me and because I tend to be the strong one who does all the stuff, he's probably male'. And so we have the idea of a god. Then, because when we make things we do it with the intention of doing something with them, early man asks himself , 'If he made it, what did he make it for?' Now the real trap springs, because early man is thinking, 'This world fits me very well. Here are all these things that support me and feed me and look after me; yes, this world fits me nicely' and he reaches the inescapable conclusion that whoever made it, made it for him.

This is rather as if you imagine a puddle waking up one morning and thinking, 'This is an interesting world I find myself in—an interesting *hole* I find myself in—fits me rather neatly, doesn't it? In fact it fits me staggeringly well, must have been made to have me in it!' This is such a powerful idea that as the sun rises in the sky and the air heats up and as, gradually, the puddle gets smaller and smaller, it's still frantically hanging on to the notion that everything's going to be alright, because this world was *meant* to have him in it, was *built* to have him in it; so the moment he disappears catches him rather by surprise. I think this may be something we need to be on the watch out for. We all know that at some point in the future the Universe will come to an end and at some other point,

considerably in advance from that but still not immediately pressing, the sun will explode. We feel there's plenty of time to worry about that, but on the other hand that's a very dangerous thing to say. Look at what's supposed to be going to happen on the 1st of January 2000—let's not pretend that we didn't have a warning that the century was going to end! I think that we need to take a larger perspective on who we are and what we are doing here if we are going to survive in the long term.

There are some oddities in the perspective with which we see the world. The fact that we live at the bottom of a deep gravity well, on the surface of a gas covered planet going around a nuclear fireball 90 million miles away and think this to be normal is obviously some indication of how skewed our perspective tends to be, but we have done various things over intellectual history to slowly correct some of our misapprehensions. Curiously enough, quite a lot of these have come from sand, so let's talk about the four ages of sand.

From sand we make glass, from glass we make lenses and from lenses we make telescopes. When the great early astronomers, Copernicus, Gallileo and others turned their telescopes on the heavens and discovered that the Universe was an astonishingly different place than we expected and that, far from the world being most of the Universe, with just a few little bright lights going around it, it turned out—and this took a long, long, long time to sink in—that it is just one tiny little speck going round a little nuclear fireball, which is one of millions and millions and millions that make up this particular galaxy and our galaxy is one of millions or billions that make up the Universe and that then we are also faced with the possibility that there may be billions of universes, that applied a little bit of a corrective to the perspective that the Universe was ours.

I rather love that notion and, as I was discussing with someone earlier today, there's a book I thoroughly enjoyed recently by David Deutsch, who is an advocate of the multiple universe view of the Universe, called '*The Fabric of Reality*', in which he explores the notion of a quantum multiple universe view of the Universe. This came from the famous wave particle dichotomy about the behaviour of light—that you couldn't measure it as a wave when it behaves as a wave, or as a particle when it behaves as a particle. How does this come to be? David Deutsch points out that if you imagine that our Universe is simply one layer and that there is an infinite

multiplicity of universes spreading out on either side, not only does it solve the problem, but the problem simply goes away. This is exactly how you expect light to behave under those circumstances. Quantum mechanics has claims to be predicated on the notion that the Universe behaves as if there was a multiplicity of universes, but it rather strains our credulity to think that there actually would be.

This goes straight back to Gallileo and the Vatican. In fact, what the Vatican said to Gallileo was, "We don't dispute your readings, we just dispute the explanation you put on them. It's all very well for you to say that the planets sort of do that as they go round and it is as if we were a planet and those planets were all going round the sun; it's alright to say it's *as if* that were happening, but you're not allowed to say that's what *is* happening, because we have a total lockhold on universal truth and also it simply strains our personal credulity". Just so, I think that the idea that there are multiple universes currently strains our credulity but it may well be that it's simply one more strain that we have to learn to live with, just as we've had to learn to live with a whole bunch of them in the past.

The other thing that comes out of that vision of the Universe is that it turns out to be composed almost entirely and rather worryingly, of nothing. Wherever you look there is nothing, with occasional tiny, tiny little specks of rock or light. But nevertheless, by watching the way these tiny little specks behave in the vast nothingness, we begin to divine certain principles, certain laws, like gravity and so forth. So that was, if you like, the macroscopic view of the universe, which came from the first age of sand.

The next age of sand is the microscopic one. We put glass lenses into microscopes and started to look down at the microscopic view of the Universe. Then we began to understand that when we get down to the sub-atomic level, the solid world we live in also consists, again rather worryingly, of almost nothing and that wherever we do find something it turns out not to be actually something, but only the probability that there may be something there.

One way or another, this is a deeply misleading Universe. Wherever we look it's beginning to be extremely alarming and extremely upsetting to our sense of who we are—great, strapping, physical people living in a

Universe that exists almost entirely for us—that it just isn't the case. At this point we are still divining from this all sorts of fundamental principles, recognising the way that gravity works, the way that strong and weak nuclear forces work, recognising the nature of matter, the nature of particles and so on, but having got those fundamentals, we're still not very good at figuring out how it works, because the maths is really rather tricky. So, we tend to come up with almost a clockwork view of the way it all works, because that's the best our maths can manage. I don't mean in any way to disparage Newton, because I guess he was the first person who saw that there were principles at work that were different from anything we actually saw around us. His first law of motion—that something will remain in its position of either rest or motion until some other force works on it—is something that none of us, living in a gravity well, in a gas envelope, had ever seen, because everything we move comes to a halt. It was only through very, very careful watching and observing and measuring and divining the principles underlying what we could all see happening that he came up with the principles that we all know and recognise as being the laws of motion, but nevertheless it is by modern terms, still a somewhat clockwork view of the Universe. As I say, I don't mean that to sound disparaging in any way at all, because his achievements, as we all know, were absolutely monumental, but it still kind of doesn't make sense to us.

Now there are all sorts of entities we are also aware of, as well as particles, forces, tables, chairs, rocks and so on, that are almost invisible to science; almost invisible, because science has almost nothing to say about them whatsoever. I'm talking about dogs and cats and cows and each other. We living things are, so far, beyond the purview of anything science can actually say, almost beyond even recognising ourselves as things that science might be expected to have something to say about.

I can imagine Newton sitting down and working out his laws of motion and figuring out the way the Universe works and with him, a cat wandering around. The reason we had no idea how cats worked was because, since Newton, we had proceeded by the very simple principle that essentially, to see how things work, we took them apart. If you try and take a cat apart to see how it works, the first thing you have in your hands is a non-working cat. Life is a level of complexity that almost lies outside our vision; is so far beyond anything we have any means of understanding that

we just think of it as a different class of object, a different class of matter; 'life', something that had a mysterious essence about it, was god given—and that's the only explanation we had. The bombshell comes in 1859 when Darwin publishes '*On the Origin of Species*'. It takes a long time before we really get to grips with this and begin to understand it, because not only does it seem incredible and thoroughly demeaning to us, but it's yet another shock to our system to discover that not only are we not the centre of the Universe and we're not made of anything, but we started out as some kind of slime and got to where we are via being a monkey. It just doesn't read well. But also, we have no opportunity to see this stuff at work. In a sense Darwin was like Newton, in that he was the first person to see underlying principles, that really were not at all obvious, from the everyday world in which he lived. We had to think very hard to understand the nature of what was happening around us and we had no clear, obvious everyday examples of evolution to point to. Even today that persists as a slightly tricky problem if you're trying to persuade somebody who doesn't believe in all this evolution stuff and wants you to show him an example—they are hard to find in terms of everyday observation.

So we come to the third age of sand. In the third age of sand we discover something else we can make out of sand—silicon. We make the silicon chip—and suddenly, what opens up to us is a Universe not of fundamental particles and fundamental forces, but of the things that were missing in that picture that told us how they work; what the silicon chip revealed to us was the *process*. The silicon chip enables us to do mathematics tremendously fast, to model the, as it turns out, very very simple processes that are analogous to life in terms of their simplicity; iteration, looping, branching, the feedback loop which lies at the heart of everything you do on a computer and at the heart of everything that happens in evolution—that is, the output stage of one generation becomes the input stage of the next. Suddenly we have a working model, not for a while because early machines are terribly slow and clunky, but gradually we accumulate a working model of this thing that previously we could only guess at or deduce—and you had to be a pretty sharp and a pretty clear thinker even to divine it happening when it was far from obvious and indeed counter-intuitive, particularly to as proud a species as we.

The computer forms a third age of perspective, because suddenly it enables us to see how life works. Now that is an extraordinarily important point

because it becomes self-evident that life, that all forms of complexity, do not flow downwards, they flow upwards and there's a whole grammar that anybody who is used to using computers is now familiar with, which means that evolution is no longer a particular thing, because anybody who's ever looked at the way a computer program works, knows that very, very simple iterative pieces of code, each line of which is tremendously straightforward, give rise to enormously complex phenomena in a computer—and by enormously complex phenomena, I mean a word processing program just as much as I mean Tierra or Creatures.

I can remember the first time I ever read a programming manual, many many years ago. I'd first started to encounter computers about 1983 and I wanted to know a little bit more about them, so I decided to learn something about programming. I bought a C manual and I read through the first two or three chapters, which took me about a week. At the end it said 'Congratulations, you have now written the letter A on the screen!' I thought, 'Well, I must have misunderstood something here, because it was a huge, huge amount of work to do that, so what if I now want to write a B?' The process of programming, the speed and the means by which enormous simplicity gives rise to enormously complex results, was not part of my mental grammar at that point. It is now—and it is increasingly part of all our mental grammars, because we are used to the way computers work.

So, suddenly, evolution ceases to be such a real problem to get hold of. It's rather like this: imagine, if you will, the following scenario. One Tuesday, a person is spotted in a street in London, doing something criminal. Two detectives are investigating, trying to work out what happened. One of them is a 20th Century detective and the other, by the marvels of science fiction, is a 19th Century detective. The problem is this: the person who was clearly seen and identified on the street in London on Tuesday was seen by someone else, an equally reliable witness, on the street in Santa Fe on the same Tuesday—how could that possibly be? The 19th Century detective could only think it was by some sort of magical intervention. Now the 20th Century detective may not be able to say, "He took BA flight this and then United flight that"—he may not be able to figure out exactly which way he did it, or by which route he travelled, but it's not a problem. It doesn't bother him; he just says, 'He got there by plane. I don't know

which plane and it may be a little tricky to find out, but there's no essential mystery.' We're used to the idea of jet travel. We don't know whether the criminal flew BA 178, or UA270, or whatever, but we know roughly how it was done. I suspect that as we become more and more conversant with the role a computer plays and the way in which the computer models the process of enormously simple elements giving rise to enormously complex results, then the idea of life being an emergent phenomenon will become easier and easier to swallow. We may never know precisely what steps life took in the very early stages of this planet, but it's not a mystery.

So what we have arrived at here—and although the first shock wave of this arrival was in 1859, it's really the arrival of the computer that demonstrates it unarguably to us—is 'Is there really a Universe that is not designed from the top downwards but from the bottom upwards? Can complexity emerge from lower levels of simplicity?' It has always struck me as being bizarre that the idea of God as a creator was considered sufficient explanation for the complexity we see around us, because it simply doesn't explain where he came from. If we imagine a designer, that implies a design and that therefore each thing he designs or causes to be designed is a level simpler than him or her, then you have to ask 'What is the level above the designer?' There is one peculiar model of the Universe that has turtles all the way down, but here we have gods all the way up. It really isn't a very good answer, but a bottom-up solution, on the other hand, which rests on the incredibly powerful tautology of anything that happens, happens, clearly gives you a very simple and powerful answer that needs no other explanation whatsoever.

But here's the interesting thing. I said I wanted to ask 'Is there an artificial god?' and this is where I want to address the question of why the idea of a god is so persuasive. I've already explained where I feel this kind of illusion comes from in the first place; it comes from a falseness in our perspective, because we are not taking into account that we are evolved beings, beings who have evolved into a particular landscape, into a particular environment with a particular set of skills and views of the world that have enabled us to survive and thrive rather successfully. But there seems to be an even more powerful idea than that, and this is the idea I want to propose, which is that the spot at the top of the pyramid that we previously said was whence everything flowed, may not actually be vacant just because we say the flow doesn't go that way.

Let me explain what I mean by this. We have created in the world in which we live all kinds of things; we have changed our world in all kinds of ways. That's very very clear. We have built the room we're in and we've built all sorts of complex stuff, like computers and so on, but we've also constructed all kinds of fictitious entities that are enormously powerful. So do we say, 'That's a bad idea; it's stupid—we should simply get rid of it?' Well, here's another fictitious entity—money. Money is a completely fictitious entity, but it's very powerful in our world; we each have wallets, which have got notes in them, but what can those notes do? You can't breed them, you can't stir fry them, you can't live in them, there's absolutely nothing you can do with them that's any use, other than exchange them with each other—and as soon as we exchange them with each other all sots of powerful things happen, because it's a fiction that we've all subscribed to. We don't think this is wrong or right, good or bad; but the thing is that if money vanished the entire co-operative structure that we have would implode, but if we were all to vanish, money would simply vanish too. Money has no meaning outside ourselves, it is something that we have created that has a powerful shaping effect on the world, because its something we all subscribe to.

I would like somebody to write an evolutionary history of religion, because the way in which it has developed seems to me to show all kinds of evolutionary strategies. Think of the arms races that go on between one or two animals living the same environment. For example the race between the Amazonian manatee and a particular type of reed that it eats. The more of the reed the manatee eats, the more the reed develops silica in its cells to attack the teeth of the manatee and the more silica in the reed, the more manatee's teeth get bigger and stronger. One side does one thing and the other counters it. As we know, throughout evolution and history arms races are something that drive evolution in the most powerful ways and in the world of ideas you can see similar kinds of things happening.

Now, the invention of the scientific method and science is, I'm sure we'll all agree, the most powerful intellectual idea, the most powerful framework for thinking and investigating and understanding and challenging the world around us that there is, and that it rests on the premise that any idea is there to be attacked and if it withstands the attack then it lives to fight another day and if it doesn't withstand the attack then down it goes. Religion doesn't seem to work like that; it has certain ideas at the heart of it

which we call sacred or holy or whatever. That's an idea we're so familiar with, whether we subscribe to it or not, that it's kind of odd to think what it actually means, because really what it means is 'Here is an idea or a notion that you're not allowed to say anything bad about; you're just not. Why not? — because you're not!' If somebody votes for a party that you don't agree with, you're free to argue about it as much as you like; everybody will have an argument but nobody feels aggrieved by it. If somebody thinks taxes should go up or down you are free to have an argument about it, but on the other hand if somebody says 'I mustn't move a light switch on a Saturday', you say, 'Fine, I respect that'. The odd thing is, even as I am saying that I am thinking 'Is there an Orthodox Jew here who is going to be offended by the fact that I just said that?' but I wouldn't have thought 'Maybe there's somebody from the left wing or somebody from the right wing or somebody who subscribes to this view or the other in economics' when I was making the other points. I just think 'Fine, we have different opinions'. But, the moment I say something that has something to do with somebody's (I'm going to stick my neck out here and say irrational) beliefs, then we all become terribly protective and terribly defensive and say 'No, we don't attack that; that's an irrational belief but no, we respect it'.

It's rather like, if you think back in terms of animal evolution, an animal that's grown an incredible carapace around it, such as a tortoise—that's a great survival strategy because nothing can get through it; or maybe like a poisonous fish that nothing will come close to, which therefore thrives by keeping away any challenges to what it is it is. In the case of an idea, if we think 'Here is an idea that is protected by holiness or sanctity', what does it mean? Why should it be that it's perfectly legitimate to support the Labour party or the Conservative party, Republicans or Democrats, this model of economics versus that, Macintosh instead of Windows, but to have an opinion about how the Universe began, about who created the Universe, no, that's holy? What does that mean? Why do we ring-fence that for any other reason other than that we've just got used to doing so? There's no other reason at all, it's just one of those things that crept into being and once that loop gets going it's very, very powerful. So, we are used to not challenging religious ideas but it's very interesting how much of a furore Richard creates when he does it! Everybody gets absolutely frantic about it because you're not allowed to say these things. Yet when you look at it rationally there is no reason why those ideas shouldn't be as open to debate

as any other, except that we have agreed somehow between us that they shouldn't be.

There's a very interesting book—I don't know if anybody here's read it—called 'Man on Earth' by an anthropologist who use to be at Cambridge, called John Reader, in which he describes the way that… I'm going to back up a little bit and tell you about the whole book. It's a series of studies of different cultures in the world that have developed within somewhat isolated circumstances, either on islands or in a mountain valley or wherever, so it's possible to treat them to a certain extent as a test-tube case. You see therefore exactly the degree to which their environment and their immediate circumstances has affected the way in which their culture has arisen. It's a fascinating series of studies. The one I have in mind at the moment is one that describes the culture and economy of Bali, which is a small, very crowded island that subsists on rice. Now, rice is an incredibly efficient food and you can grow an awful lot in a relatively small space, but it's hugely labour intensive and requires a lot of very, very precise co-operation amongst the people there, particularly when you have a large population on a small island needing to bring its harvest in. People now looking at the way in which rice agriculture works in Bali are rather puzzled by it because it is intensely religious. The society of Bali is such that religion permeates every single aspect of it and everybody in that culture is very, very carefully defined in terms of who they are, what their status is and what their role in life is. It's all defined by the church; they have very peculiar calendars and a very peculiar set of customs and rituals, which are precisely defined and, oddly enough, they are fantastically good at being very, very productive with their rice harvest. In the 70s, people came in and noticed that the rice harvest was determined by the temple calendar. It seemed to be totally nonsensical, so they said, 'Get rid of all this, we can help you make your rice harvest much, much more productive than even you're, very successfully, doing at the moment. Use these pesticides, use this calendar, do this, that and the other'. So they started and for two or three years the rice production went up enormously, but the whole predator/prey/pest balance went completely out of kilter. Very shortly, the rice harvest plummeted again and the Balinese said, 'Screw it, we're going back to the temple calendar!' and they reinstated what was there before and it all worked again absolutely perfectly. It's all very well to say that basing the rice harvest on something as irrational and meaningless as a religion is stupid—they should be able to work it out

more logically than that, but they might just as well say to us, 'Your culture and society works on the basis of money and that's a fiction, so why don't you get rid of it and just co-operate with each other'—we know it's not going to work!

So, there is a sense in which we build meta-systems above ourselves to fill in the space that we previously populated with an entity that was supposed to be the intentional designer, the creator (even though there isn't one) and because we—I don't necessarily mean we in this room, but we as a species—design and create one and then allow ourselves to behave as if there *was* one, all sorts of things begin to happen that otherwise wouldn't happen.

Let me try and illustrate what I mean by something else. This is very speculative; I'm really going out on a limb here, because it's something I know nothing about whatsoever, so think of this more as a thought experiment than a real explanation of something. I want to talk about Feng Shui, which is something I know very little about, but there's been a lot of talk about it recently in terms of figuring out how a building should be designed, built, situated, decorated and so on. Apparently, we need to think about the building being inhabited by dragons and look at it in terms of how a dragon would move around it. So, if a dragon wouldn't be happy in the house, you have to put a red fish bowl here or a window there. This sounds like complete and utter nonsense, because anything involving dragons must be nonsense—there aren't any dragons, so any theory based on how dragons behave is nonsense. What are these silly people doing, imagining that dragons can tell you how to build your house? Nevertheless, it occurs to me if you disregard for a moment the explanation that's actually offered for it, it may be there is something interesting going on that goes like this: we all know from buildings that we've lived in, worked in, been in or stayed in, that some are more comfortable, more pleasant and more agreeable to live in than others. We haven't had a real way of quantifying this, but in this century we've had an awful lot of architects who think they know how to do it, so we've had the horrible idea of the house as a machine for living in, we've had Mies van der Roe and others putting up glass stumps and strangely shaped things that are supposed to form some theory or other. It's all carefully engineered, but nonetheless, their buildings are not actually very nice to live in. An awful lot of theory has been poured into this, but if you sit and work with an

architect (and I've been through that stressful time, as I'm sure a lot of people have) then when you are trying to figure out how a room should work you're trying to integrate all kinds of things about lighting, about angles, about how people move and how people live—and an awful lot of other things you don't know about that get left out. You don't know what importance to attach to one thing or another; you're trying to, very consciously, figure out something when you haven't really got much of a clue, but there's this theory and that theory, this bit of engineering practice and that bit of architectural practice; you don't really know what to make of them. Compare that to somebody who tosses a cricket ball at you. You can sit and watch it and say, 'It's going at 17 degrees'; start to work it out on paper, do some calculus, etc. and about a week after the ball's whizzed past you, you may have figured out where it's going to be and how to catch it. On the other hand, you can simply put your hand out and let the ball drop into it, because we have all kinds of faculties built into us, just below the conscious level, able to do all kinds of complex integrations of all kinds of complex phenomena which therefore enables us to say, 'Oh look, there's a ball coming; catch it!'

What I'm suggesting is that Feng Shui and an awful lot of other things are precisely of that kind of problem. There are all sorts of things we know *how* to do, but don't necessarily know *what* we do, we just do them. Go back to the issue of how you figure out how a room or a house should be designed and instead of going through all the business of trying to work out the angles and trying to digest which genuine architectural principles you may want to take out of what may be a passing architectural fad, just ask yourself, 'how would a dragon live here?' We are used to thinking in terms of organic creatures; an organic creature may consist of an enormous complexity of all sorts of different variables that are beyond our ability to resolve but we know *how* organic creatures live. We've never seen a dragon but we've all got an idea of what a dragon is like, so we can say, 'Well if a dragon went through here, he'd get stuck just here and a little bit cross over there because he couldn't see that and he'd wave his tail and knock that vase over'. You figure out how the dragon's going to be happy here and lo and behold! you've suddenly got a place that makes sense for other organic creatures, such as ourselves, to live in.

So, my argument is that as we become more and more scientifically literate, it's worth remembering that the fictions with which we previously

populated our world may have some function that it's worth trying to understand and preserve the essential components of, rather than throwing out the baby with the bath water; because even though we may not accept the reasons given for them being here in the first place, it may well be that there are good practical reasons for them, or something like them, to be there. I suspect that as we move further and further into the field of digital or artificial life we will find more and more unexpected properties begin to emerge out of what we see happening and that this is a precise parallel to the entities we create around ourselves to inform and shape our lives and enable us to work and live together. Therefore, I would argue that though there isn't an *actual* god there is an *artificial* god and we should probably bear that in mind. That is my debating point and you are now free to start hurling the chairs around!

Q – What is the fourth age of sand?

Let me back up for a minute and talk about the way we communicate. Traditionally, we have a bunch of different ways in which we communicate with each other. One way is one-to-one; we talk to each other, have a conversation. Another is one-to-many, which I'm doing at the moment, or someone could stand up and sing a song, or announce we've got to go to war. Then we have many-to-one communication; we have a pretty patchy, clunky, not-really-working version we call democracy, but in a more primitive state I would stand up and say, 'OK, we're going to go to war' and some may shout back 'No we're not!'—and then we have many-to-many communication in the argument that breaks out afterwards!

In this century (and the previous century) we modelled one-to-one communications in the telephone, which I assume we are all familiar with. We have one-to-many communication—boy do we have an awful lot of that; broadcasting, publishing, journalism, etc.—we get information poured at us from all over the place and it's completely indiscriminate as to where it might land. It's curious, but we don't have to go very far back in our history until we find that all the information that reached us was relevant to us and therefore anything that happened, any news, whether it was about something that's actually happened to us, in the next house, or in the next village, within the boundary or within our horizon, it happened in our world and if we reacted to it the world reacted back. It was all relevant to us, so for example, if somebody had a terrible accident we could crowd

round and really help. Nowadays, because of the plethora of one-to-many communication we have, if a plane crashes in India we may get terribly anxious about it but our anxiety doesn't have any impact. We're not very well able to distinguish between a terrible emergency that's happened to somebody a world away and something that's happened to someone round the corner. We can't really distinguish between them any more, which is why we get terribly upset by something that has happened to somebody in a soap opera that comes out of Hollywood and maybe less concerned when it's happened to our sister. We've all become twisted and disconnected and it's not surprising that we feel very stressed and alienated in the world because the world impacts on us but we don't impact the world. Then there's many-to-one; we have that, but not very well yet and there's not much of it about. Essentially, our democratic systems are a model of that and though they're not very good, they will improve dramatically.

But the fourth, the many-to-many, we didn't have at all before the coming of the Internet, which, of course, runs on fibre-optics. It's communication between us that forms the fourth age of sand. Take what I said earlier about the world not reacting to us when we react to it; I remember the first moment, a few years ago, at which I began to take the Internet seriously. It was a very, very silly thing. There was a guy, a computer research student at Carnegie Mellon, who liked to drink Dr Pepper Light. There was a drinks machine a couple of storeys away from him, where he used to regularly go and get his Dr Pepper, but the machine was often out of stock, so he had quite a few wasted journeys. Eventually he figured out, 'Hang on, there's a chip in there and I'm on a computer and there's a network running around the building, so why don't I just put the drinks machine on the network, then I can poll it from my terminal whenever I want and tell if I'm going to have a wasted journey or not?' So he connected the machine to the local network, but the local net was part of the Internet—so suddenly anyone in the world could see what was happening with this drinks machine. Now that may not be vital information but it turned out to be curiously fascinating; everyone started to know what was happening with the drinks machine. It began to develop, because in the chip in the machine didn't just say, 'The slot which has Dr Pepper Light is empty' but had all sorts of information; it said, 'There are 7 Cokes and 3 Diet Cokes, the temperature they are stored at is this and the last time they were loaded was that'. There was a lot of information in there, and there was one really

fabulous piece of information: it turned out that if someone had put their 50 cents in and not pressed the button, i.e. if the machine was pregnant, then you could, from your computer terminal wherever you were in the world, log on to the drinks machine and drop that can! Somebody could be walking down the corridor when suddenly, 'bang!' — there was a Coca-Cola can! What caused that? — well *obviously* somebody 5,000 miles away! Now that was a very, very silly, but fascinating, story and what it said to me was that this was the first time that we could reach back into the world. It may not be terribly important that from 5,000 miles away you can reach into a University corridor and drop a Coca-Cola can but it's the first shot in the war of bringing to us a whole new way of communicating. So that, I think, is the fourth age of sand.

Douglas Adams.

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