CHAPTER I

What is the problem?

The problem is to reconcile the central place which chance has in the scientific account of the world with the theological account of God’s relationship to the world. Chance suggests lack of purpose; theology speaks of purpose. This long-running source of tension has come to the fore again in the claims of the Intelligent Design movement, which aims to eliminate chance in favour of design. Quantum theory, which places chance at the heart of matter, poses essentially the same question for theologians. This chapter sets the scene and, very briefly, points the way to a solution which lies in seeing chance within, not outside, the providence of God.

CHANCE VERSUS GOD

Chance has become a major weapon of those who regard science and theology as locked in mortal combat. On the theological side there are those like Sproul,¹ who signals his intentions in the title of a book Not a Chance (1994). The subtitle makes

¹ Dr R. C. Sproul is an American theologian in the strict Calvinist tradition. He is a prolific author and the chairman of Ligonier Ministries, which he founded. The book, from which these quotations come, appears to be his only excursion into the science and religion field though his argument is primarily directed against what he perceives to be the faulty logic used by mainstream scientists. The quotations used here were chosen because they express, with great clarity, an extreme position adopted by some Christians.
his intentions doubly clear: *The Myth of Chance in Modern Science and Cosmology*. In the preface he goes on to say ‘this book’ may be viewed as a diatribe against chance. ‘It is my purpose to show that it is logically impossible to ascribe any power to chance whatever.’ As if that did not make his intentions clear enough he continues, on page 3, ‘If chance exists in its frailest possible form, God is finished . . . If chance exists in any size, shape or form, God cannot exist.’

These are strong words indeed and one can only marvel that such an annihilation can be accomplished in hardly more than two hundred pages. Sproul is not alone, of course, though few other protagonists claim quite so much. Overman is another who has entered the lists with his *A Case against Accident and Self-organization* (1997). This is a more sharply focussed attack and with more technical apparatus, but its intention is much the same. Those unfamiliar with the probability logic involved may be easily impressed when he concludes: ‘The probability of chance causing the formation of a universe complete with life and the first forms of living matter is less than the mathematical impossibility at the accepted standard of $1 \times 10^{50}$’ (p. 181). It is not clear where he acquired this ‘accepted standard’ or who accepts it! We shall return to the matter of very small probabilities later.

Dean L. Overman is a distinguished lawyer based in Washington DC. The foreword to his book was contributed by Wolfhart Pannenberg and there is a commendation on the flyleaf by Alister McGrath. The laudatory remarks on the dust cover include quotations from Owen Gingerich and John Polkinghorne. It seems generally agreed that this is a detailed and clear approach to a very important topic, but endorsement of the conclusions reached is not so easy to find. In my judgement the central conclusion, like many of its kind, is based on a fallacious probability argument as will be shown later.
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From the science side there are equally forceful advocates for chance. Although it was written more than thirty years ago, Jacques Monod’s *Chance and Necessity* remains one of the most eloquent statements of the contrary view. Although often quoted, it bears repetition.

We say that these events are accidental, due to chance. And since they constitute the only possible source of modifications in the genetic text, itself the sole repository of the organism’s hereditary structures, it necessarily follows that chance alone is at the source of every innovation, of all creation in the biosphere. Pure chance, absolutely free but blind, at the very root of the stupendous edifice of evolution: this central concept of modern biology is no longer one among other possible or even conceivable hypotheses. It is today the sole conceivable hypothesis, the only one compatible with observed and tested fact. And nothing warrants the supposition (or the hope) that conceptions about this should, or ever could, be revised. (1970, p. 110; trans. Wainhouse 1972)

Oddly enough, both sides agree that chance eliminates God. Sproul’s remedy is to oust chance; Monod’s, to do the same to God.

The object of this book, roughly speaking, is to bridge the gap by saving Sproul’s theology and Monod’s science using chance as the link between them. Sproul was wrong in seeing chance as a threat to the sovereignty of God and Monod was wrong in seeing chance as eliminating God. These are strong claims and their justification rests, essentially, on the claim that chance must be seen as lying within the providence of God and not outside it.

As I pause to draw breath it is pertinent to remark that whatever chance is, it is certainly not an agent capable of causing anything, as Overman supposes. Even such a careful writer as Dowe (2005) falls into this trap when he writes ‘If the latter is true God does not cause any event caused by chance’
But there is a broader field to survey before we return to this matter.

The essential problem is how to accommodate within a single world-view the element of real chance, which science seems to require, and the existence of a God who is supposed to be actively involved in creating and influencing what happens in the world.

A good deal clearly hangs on what we mean by chance. This is not such an easy matter as it may seem and it forms the subject of chapter 2. A chance event arises when something happens which we could not predict, but this may be because we do not have enough information. Chance is then the other side of the coin to our ignorance; this is sometimes called epistemological chance. Alternatively, chance may be ontological. That is, it is somehow inherent in the nature of things and there is no knowledge we could possibly have which would make any difference. This brings us to the crucial issue of God’s involvement in the world because this depends on what view we take on the nature of chance.

Nevertheless there are some situations where we do not need to answer the deep philosophical questions. In particular, these arise when we come to calculate probabilities. The theory of probability is not so much about what probability is as about how to make probability calculations about uncertain happenings. Any attempt to calculate the probability that life would appear on earth, for example, depends upon putting together the probabilities of simpler, constituent events which were necessary for life to appear. This is where Overman, and many like him, have gone wrong.

Next there are rather crucial questions about what is implied by the existence of chance happenings in the world. It is commonly assumed to be self-evident that any intrusion of chance will lead to unpredictability and uncontrollability. This is not
necessarily so and quite the opposite may be true. We shall discover that there may be extreme constraints which render the outcome of some chance processes almost certain. There is also an important matter of levels, to which we come in a moment, where what is uncertain at one level may be virtually certain at another level. Dying, for example, is still a highly unpredictable matter for individuals, but insurance companies and undertakers make a steady living out of it because what is individually uncertain is highly predictable in the aggregate.

There are equally weighty questions to be raised on the theological side about the nature of God. It was Sproul’s determination to defend the sovereignty of God that led him to conclude that chance was impossible in God’s world. Is it really true that absolute sovereignty requires that God knows and controls every one of the trillion upon trillions of events that occur in the universe every second? Might it not be that such a view actually diminishes the greatness of God? I shall, in fact, argue that this is the case.

More important, perhaps, is the effect which uncertainty in the world has on what God can know — his omniscience. Can he know, for example, what is as yet undetermined? Can we be truly free in a world in which God controls every single thing? I raise such questions now merely to show that the chance issue is not peripheral, but goes to the heart of age-old questions which have become even more pertinent in a scientific age than they were in the early centuries after Christ, or even in the Middle Ages.

New questions arise which can only be phrased in the language of chance or risk. We have to ask not merely whether God can cope with chance or even use it to good effect, but whether it might have a more positive role. After all, we use chance in large-scale computer modelling to mimic the uncertainty of the world, and to achieve goals which lie beyond
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our reach without it. If we find that risk taking can be beneficial and not always a necessary evil, may this not open new perspectives for theology? Can we conceive of God as a risk taker? This is, perhaps, the key theological question and we return to it in chapter 14.

Chance and providence go together in popular debate because each seems to be at variance with the other. How can God act providentially in a world if it is not wholly under his control? This question is distinct from, but not unrelated to, the question of whether and how God can act in the lawful world revealed by science. What kind of a place the world is also affects what we can know about it. If there is genuine uncertainty about what we observe, then presumably there is some uncertainty about what we can infer about it. More especially, and challenging perhaps, is the question of what we can know about God and his purposes for us and the whole creation. Are there any certainties left for the believer or, indeed, the unbeliever?

Next, there is the relationship between chance and law. The two seem to be in direct opposition but this is not necessarily true. In fact some laws have been correctly described as statistical, or probabilistic. These are laws which relate to large aggregates and thus operate at what I have called a different level. The simplest possible example is the tossing of a coin. The outcome of a single toss is a highly uncertain matter but the outcome of 10 million tosses is highly predictable in the sense that we can say that almost exactly 50 per cent of all tosses will be heads and, furthermore, we can also be precise about what deviation from that average figure is likely to be. The constancy of such ratios certainly has the law-like characteristic we expect in dealing with a system of divine origin and concern. The gas laws are a more interesting example, where the relationship between the pressure and volume of a gas at
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A constant temperature is simply determined by the average effect of a very large number of gas molecules. Lawfulness at the higher level of aggregation is thus the direct consequence of complete randomness at the lower level.

This intimate relationship between levels of aggregation also works the other way round: lawfulness can give rise to chaos. The word chaos is used here in its technical sense but, for present purposes we can think of it as, more or less, equivalent to chance. Very simple, law-abiding processes can give rise to chance. The subtlety of these relationships emphasises that what we see in the world depends on the level at which we enter it to make our observation. The same is true in the realm of physics where, as we shall see, the quantum world seems very different to the everyday world viewed on the human scale.

As we unravel the complexities of these relationships it will become apparent that Sproul’s and Overman’s categorical statements are not so much wrong as inapplicable to the world in which we actually live, or to the God who created and sustains it.

Levels and Scales

Before we go any further I must digress to expand on something which has already cropped up several times and which is central to the question of God’s sovereignty. What we observe in the world, and how we describe it, depends upon how big

1 The idea of levels and scales occurs in other contexts. A recent example is provided by The View from the Centre of the Universe by Primak and Abrams (2006). The prime object of that book is to argue that, in a certain sense, we are at the centre of things and that gives us significance as humans. For example, humans are at the centre of the scale of size. If length is measured in orders of magnitude (that is powers of ten) then lengths on the human scale come somewhere near the middle of the range which extends from the smallest things we know (the Planck length of 10^{-33} cm) to the
or small a scale we view it on. The world viewed through a microscope is very different from what we see through a telescope. On the astronomical scale we simply do not notice the biological details of nature. The microscopic world has no place for mountains and trees. They are too big to be viewed on such a small scale.

If we go to the limits of size, in either direction, the worlds we find are beyond our imagining and the best we can do is to describe them by mathematical equations. On the very large scale, the Euclidian geometry of the schoolroom lets us down and we then have to reckon with things moving close to the speed of light. Space has to be thought of as curved and we find ourselves in a world in which Newton’s physics is inadequate and our imagination fails.

Something similar occurs at the smaller end of the scale where we get down to the level of atoms and what goes on inside them. It is an unfamiliar world in which our intuitions based on the everyday world simply do not work. The mathematics continues to work perfectly and delivers results which are entirely consistent with the world as we perceive it at our level, but any attempt to picture it fails.

For practical purposes, we can think of three levels. First, the everyday world of things that we can see, touch and handle, where distances are measured in metres or miles – but not in largest (the distance of the cosmic horizon of $10^{28}$ cm). Similarly, if less convincingly, human life has occurred in the middle of time measured from the beginning to end of the universe or the life of the earth. The important thing, from the present perspective, is that according to the authors, certain questions only have meaning – and hence meaningful answers – if posed at the appropriate level. This idea is applied in many fields including the nature of God. ‘God’ must therefore mean something different on different size-scales yet encompass all of them. For example, all-loving, all-knowing, all-everything-else-we-humans-do-only-partially-well may suggest God-possibilities on the human size-scale, but what about all the other scales? What might God mean on the galactic scale, or the atomic?
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light years – where weight is measured in pounds and tonnes, and so forth. This I shall often refer to as the human level, or scale.

Secondly there is the world of the very small – too small to be observed by the naked eye – the world of cells, molecules, atoms and electrons. At best we can only see parts of this world through microscopes but often what is going on has to be observed indirectly through the observable consequences of what is happening at the micro level beyond the limits of our direct observation. This may conveniently be designated the micro level.

Finally, there is the world of the very large where, for example, masses can be so large as to produce observable deflection of a beam of light. In this world we encounter incomprehensibly large numbers and unimaginably long periods of time. This I shall call the macro or cosmic level. We can sometimes be helped to grasp the significance of these things if they are scaled down to something we can understand. For example, the relative distances between the planets in the solar system can be represented by where they would appear if they were laid out on a football pitch with the distances between them in the same proportions.

The concept of scale or level is central to understanding the place that chance occupies in the grand scheme of things. For example, what appears chaotic at one level may reveal a pattern when viewed on a larger scale.

This phenomenon is familiar to computer users through the zoom-in and zoom-out facility which many computers offer. As we zoom in we see more and more of the detail and less and less of the overall picture. Conversely, when we zoom out the reverse is true. This is very obvious when viewing a map. At the lower level we see individual streets, whereas at the higher level these merge into a blur as the shape and location of the town becomes the dominant feature. When viewing text
at large magnifications we lose sight of the words and notice only the patchiness of the individual letters. When we take the broader view, the words disappear and we begin to see the pattern of the layout and so on. Each view shows a different aspect of reality.

In our world it is natural to think in terms of the human scale on which we live our lives and form our understandings and intuitions. It is in this world that we form our concepts. It is in this world that Christians believe God revealed himself on a human scale. The truth thus revealed makes sense to us because it is on our scale. It does not follow, of course, that God’s actions can be necessarily or exclusively understood at our level. In fact, as we shall see later, there have been valiant attempts to account for God’s providential action by reference to happenings at the micro level.

Since, presumably, God and his creation are not commensurable we must be very wary of creating a God in our own image and on our own scale. The intimate connection between chance and order at different levels of the creation, which has been noted above and which I shall explore later, make it very important to be careful about how we use language. To suppose arbitrarily that God’s main sphere of action is at the level we can most easily comprehend may be a dangerous and misleading assumption. This is relevant to two issues which are of great interest in themselves and which have brought chance to the fore in contemporary debates.

**INTELLIGENT DESIGN**

One of the most extraordinary phenomena to have arisen on the science and religion scene in the last few decades is the Intelligent Design movement. This is largely an American

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There is an immense literature on Intelligent Design. In this present book we are concerned only with the logic of the argument by which, it is claimed,