

A God Big Enough

John Houghton – Meteorologist

*Sir John T. Houghton, CBE, MA, DPhil, F Inst Phys, FRS.
Born 1931. Educated Rhyl Grammar School and Jesus College, Oxford.
Professor of Atmospheric Physics, Oxford University, 1976-83;
President, Royal Meteorological Society, 1976-78.
Director, Appleton Laboratory, 1979-83.
Director-General of the Meteorological Office, 1983-1991.
Honorary Fellow, Jesus College, Oxford, since 1983.
Chairman, Scientific Assessment of Intergovernmental Panel on Climate Change, 1988-2002.
Chairman, Royal Commission on Environmental Pollution, 1992-1998.
Member of the UK Government Panel on Sustainable Development, 1994-2000.
Honorary Scientist of the Hadley Centre for Climate Prediction and Research at the
Meteorological Office.
Honorary Scientist at the Rutherford Appleton Laboratory.
A Trustee of the Shell Foundation.
Chairman of the John Ray Initiative.*

When people discover that I am involved with weather forecasting and also that I am a Christian, I am often asked if I believe that there is any point in praying about the weather—praying for rain, for instance, when it is badly needed. I reply that I believe it is entirely sensible and meaningful to pray about the weather as, indeed, it is to pray about other things. But I also say that my belief in the meaningfulness of prayer in no way alters my determination as a scientist to develop the very best means of weather forecasting, nor does it cause me to doubt that the behaviour of weather systems follows deterministic scientific laws.

One of the outstanding successes of science over the last thirty years has been that of weather prediction through the use of computer models of the atmospheric circulation. Let me explain how these models are employed in what is called numerical weather prediction. First of all, observations of the state of the atmosphere over the globe are received from orbiting satellites, from balloons, from ships, from automatic recording stations and from conventional land stations. These are brought together every twelve hours to make the best description possible of the atmosphere's state at that time. Starting from that initial state, the computer solves the appropriate equations of motion and produces a forecast for the whole globe for ten or more days ahead; for this task the largest and fastest computer available is required.

Meteorologists have no doubt that the atmosphere is basically a deterministic system, in other words, that the atmosphere's future behaviour is determined by its present state and by the laws of physics. This does not mean that weather prediction can ever become an exact science. One of the main reasons for this is that the atmosphere is what is known as a chaotic system—a technical term for a system in which developments occur which are extremely sensitive to the initial conditions.

For the atmosphere, the implications of 'chaos' are such that, as Edward Lorenz, one of the world's leading meteorologists, has explained,¹ the flapping of a butterfly's wings somewhere in the atmosphere can have a noticeable effect on weather developments thousands of miles away. No conceivable observing system could record the atmosphere in that sort of detail. Not only are there practical limits to our ability to measure and observe, there are also fundamental limits. Meteorologists have a great deal to learn about the science of 'chaos' and its implications for predictability. Our current expectation is that we have a good chance of predicting the general pattern of climate change which might occur over the next hundred years or so due to man's activities, for instance, through the burning of fossil fuels, but that

our ability to forecast detailed weather cannot extend to more than perhaps two weeks.

My belief, on the one hand, in the reality of prayer and, on the other, in the scientific study of the material world as a deterministic system may seem at first to be contradictory. At best, it may seem that my life as a scientist and my religious life are in separate compartments. This, however, is not the case. It is very important to me that the two strands of my life, as a scientist and as a Christian, are brought together side by side and, so far as it is possible, intertwined. How, therefore, can the idea, on the one hand, that God is active in the world and, on the other, that events are governed by scientific laws be reconciled? The clue, I believe, is in making God big enough. To do that it is necessary to really stretch our ideas and imagination. I believe science can help in this.

Think, for instance, about the universe and its utterly fantastic size and complexity. Planet earth is one of the smaller planets orbiting around a modest-sized star we call the sun. The sun is just one of 100 billion (10^{11}) stars in the galaxy to which it belongs; some of the brightest of these stars we see in the Milky Way. Within the whole universe there are upwards of a billion (10^9) galaxies. To travel to our sun 150 million kilometres away would take just 8 minutes if travelling at the speed of light. To reach the edge of the galaxy would take 100,000 years, and to reach the edge of the universe, if that were possible, about 10 billion (10^{10}) years. These are completely mind-boggling numbers.

As astronomers have probed the universe with their telescopes—optical and radio telescopes on the ground, X-ray, ultra-violet and infra-red telescopes out in space—they have been able to discover a great deal about the processes going on in the stars, the galaxies and the space in between. Many new objects have been identified; quasars, pulsars and black holes. One of the remarkable features of this story of discovery is that the physical laws which govern what is going on in widely different parts of the universe are the same physical laws which describe events here on earth. In fact, a major achievement of modern science has been the way in which it has been possible to apply the physics of the very smallest components of matter (which are as many orders of magnitude smaller than us as the universe is larger) to reach some understanding of what is known as the Big Bang—that singular event over ten billion years ago from which the expansion of the universe began.

A similar and perhaps even more remarkable story can be told about the structure of life, with the many complex and interdependent molecules that make up even the simplest living cell. Although there remains a tremendous amount to learn about many parts of these scientific stories, all of us, scientists and laymen alike, cannot fail to be impressed with the vastness, the complexity, the intricacy and the order of it all.

We all know what it means to create something—a painting, a three course meal, a computer programme—we are creating all the time. Just try to imagine the skill and power of the One who has conceived and created the universe and who continues to maintain it in being. He is the God we are trying to think about. The size, the complexity, the beauty and the order we find in the universe are expressions of the greatness, the beauty and the orderliness of the Creator.

How does all this tie up with the scientific description of the world and the laws which we deduce from that description? The conflict which is often thought to be present between the scientific description and the description of God as Creator arises, I believe, from a misunderstanding of what both descriptions are about. Rather than a conflict there is a close connection; the order and consistency we find in our science can be seen as reflecting orderliness and consistency in the character of God himself.

Created along with the universe is its framework of space and time. This means that when we think of the Creator we think of him as being outside the space and time dimensions of our world and of our experience. That does not mean, as some suggest, that God is not present and active in the world; but it does mean that he is not confined by it. Because God's activity continually pervades the world, I do not like to talk about God intervening in our world. Although he may seem to be in some events more than others, he is in a real sense present with us all the time.

In the Gospels we find Jesus emphasising God's control over the world and God's concern for even the smallest events. A sparrow cannot fall to the ground without our heavenly Father's knowledge (Mt 10:29). Jesus encouraged his followers to look at events and circumstances in terms of God's activity. He chided the Pharisees, the religious leaders of the day, for their blindness. When they wanted to forecast the weather, their interpretation of the sky was quite good, he told them, but their interpretation of the events of the times was seriously lacking (Mt 16:3). In other words, their meteorological science was effective, but they were blind towards any appreciation of God's activity in the world.

As a Christian believer, therefore, I am looking for more than scientific order and consistency in the world and the events that surround me. Because I believe that God is also a Person who is concerned about the people he has created and is therefore concerned even about me and my small world, I am looking for evidence of God's activity in these events and circumstances. I am also looking for answers to my prayers. As I have argued in more detail elsewhere,² I believe that God is big enough to provide this double order and consistency. On the one hand, we can look for order and consistency in the scientific description of events, and on the other hand, for order and consistency in a description of those events in terms of God's activity.

It is on the subject of answers to prayer that the sceptic can be at his most critical. Christians seem to argue that God always answers their prayers even if such argument flies in the face of the facts. They pray for healing for instance. If recovery occurs that is a positive answer. If it does not, God still answers; he knows, they say what is best. How in the face of such blind faith, the sceptic will exclaim, is it possible to establish objective facts in a scientific manner? Is not the Christian indulging in a heavy dose of wishful thinking?

To question in this manner, however, is to misunderstand the nature of prayer. Prayer is not going to God with a shopping list. It is not looking for magic, rubbing the lamp and making wishes. God is not a great impersonal potentate, nor a grand Santa Claus, but he is a Person with whom we human beings can form a relationship. The exercise of prayer is the means whereby that relationship is developed. A model which Christians find helpful for that relationship is that of us as God's children communicating with him as our Father. A child is constantly asking for things. Because the child does not understand enough of his needs to know what is good for him, his father will grant some of his requests and not grant others. We can expect and want God to treat our prayers in a similar way.

Prayer is not something I find easy; I sometimes envy those much more pious in disposition than I to whom it seems to be second nature. But it is an activity which, like many things we do, becomes more real and meaningful with practice. The practice of prayer has various forms. Let me divide them into the formal and the informal. Formal prayer is presented by groups of Christians meeting together for worship in church or elsewhere. I also engage in more or less formal prayer when my wife and I each day have a short prayer time when we commit to God particular problems or the needs of particular people. I also attempt to practise more or less formal prayer on my own, although that is a discipline I cannot say I have mastered. Informal prayer I define as the bringing to God, often very briefly and without it being in any way obvious to others who may be around, a particular need, a problem of the moment or a special expression of gratitude or thanks. That sort of prayer is very important to me, not only because I find it a source of strength in the stress and tumble of everyday living, but also because it is an important way in which my faith is integrated with and woven into the rest of my life. It is probably the sort of prayer to which the apostle Paul was referring when he urged the readers of the Epistle to the Thessalonians to pray without ceasing (1 Thess 5:17).

Those who are engaged in full-time Christian work often speak of answers to prayer which have come through unusual events. Over a number of years I was closely involved with the setting up of a residential centre in Oxford for students from overseas. To those of us involved it seemed a very Christian enterprise for which it was entirely appropriate to ask for God's help. And help came.

Money came in from unexpected sources just when it was needed. A surprising turn of events enabled us to buy a very suitable property for which we had been negotiating but which we thought had been lost to us. The coupling of our prayers with these circumstances encouraged us to believe that we were partners with God in what we were trying to do; not that we should look for God only in the unusual events which may occur from time to time and which may provide a particular stimulus to faith. God is also there in the usual—I feel that it is important to attempt to look at all the circumstances that surround me from the standpoint of my relationship with God. There have, for instance, been occasions when I have prayed about particular problems or events in my scientific work. And I believe these prayers have been answered. Although in the very nature of things these answers are of a personal kind and not easy to describe to others in an objective way, they are nevertheless real.

God's work in the world is more often than not through people; that is certainly true of God's work in my own life. This means that as people we have a great responsibility—we need to be sensitive to what God wants from us. For those of us who are scientists it means that we need to face up to the question of what is the value of our scientific work and to try, as far as we are able, to ensure that the science for which we have some responsibility is properly used.

Very early in the Bible (Gen 1:28) we are told that man has been made in the image of God and that he has been placed on the earth to be its steward. We should not, therefore, be afraid to grasp the resources and capabilities we have been given, using them, first, to express worship for the Creator, and second, to care for the world and the human beings within it in ways which are consistent with the declared wishes and purpose of the One for whom we are acting as steward. A big challenge currently faced by scientists—especially by those of us who are involved with the science of the environment—is the concern about the climate change which will occur next century largely because of our increased burning of fossil fuels. We first need to understand what change in climate may take place. But our responsibility as scientists does not stop there; we also need to be thoroughly involved in the debate regarding what action can be taken to limit the amount of change, to alleviate the problems arising from change and to assist those who will have to cope with substantial change.

When thinking of God's work in the world, a particularly perplexing problem is the problem of suffering. I do not think I am unusual in finding it a real difficulty. My first wife, Margaret, fought cancer for ten years; eventually she died from it at the age of fifty-four. We prayed a lot for healing, as did many of our friends. Were those prayers answered or not? I believe they were, in two ways.

First, there were the times of particular crisis when the right medical treatment was needed and needed urgently. On many of these occasions, from the various possibilities available it was not obvious what should be done for the best. Advice came at different times from different people and different quarters, but each time we felt content that the medical course being taken was right and indeed the best available. After all, the practice of medicine is a direct use of the material resources which God has provided for us in his creation. Healing through medical means is just as much God's work as healing by any other means, natural or supernatural. The combination of medicine and prayer is therefore entirely appropriate when tackling disease.

The second way in which we felt our prayers were answered was that God provided strength to face the battle—physical, mental and spiritual—involved in coping with the cancer. This was particularly the case towards the end when we had to face the fact that the cancer was winning. The quality of Margaret's faith and trust in God was truly remarkable and an inspiration to all who met her during that period. We were very conscious of the power of God through prayer to transform our circumstances and suffering into some lasting good.

After Margaret died I questioned my belief in resurrection and the afterlife. Looking at her cold lifeless body, it seemed impossible that she could live on; but then it also seemed impossible that her strong faith and radiant spirit could just fade away into nothingness. I realised the key to my belief was the resurrection of Jesus. The historical evidence alone is not the basis of that belief. As a scientist, however

strong that evidence seems to be, it cannot on its own compensate for the scepticism I am bound to feel about dead bodies coming to life. But there is other evidence too.

There is the testimony of millions of Christians over the centuries, from the first disciples who carefully recorded their experiences in the books of the New Testament, to that of Margaret, still very vivid in my memory. And there is the personal experience I have of Jesus as one who is alive in my experience today. The Jesus I meet in the pages of the Gospels is the One I meet as I attempt to communicate with God in prayer and the One I meet through the lives and conversations of others in the Christian community.

When thinking about resurrection, an analogy I find helpful is one based on the computer.³ Computer hardware consists of the silicon chips, the wires, the disc stores, the keyboards and tape decks with which the input can be introduced, and the screens and printers which display the output. The software consists of the programmes which manipulate (and in sophisticated computers learn from) the input data and provide the means to organise the output and the contents of the store. The software is no use by itself; it needs hardware on which to act and through which to be expressed. The hardware has a limited life; in time it wears out. The software is not so perishable—it can be transferred to new hardware although it will still bear characteristics of the hardware for which it was originally written. New, more advanced hardware can provide more scope for the software, enabling not only larger calculations to be carried out but perhaps providing new capabilities. Our bodies are like the hardware providing input devices (our senses) and output devices (our limbs, speech etc), and processor and storage (our brains). Some of the software is built in from the start; it is genetically determined. Other software is continuously generated throughout our lives from interaction with our environment and with other people, from our thought processes and our choices and from interaction with the hardware. Our body, in due course, wears out like any other hardware. In resurrection, the Christian hope is for a new body which will have sufficient continuity with the old to take on the old software and which will give us new means of expression.

This computer analogy illustrates a way in which scientific thinking and thinking about faith can be brought together. I have tried to pursue elsewhere other, not dissimilar, analogies.⁴ An important characteristic of faith is that it brings together and gives meaning to seemingly very different parts of life and experience. There are two ways in which we can learn about and relate to God. He has revealed himself in the world around us with all its order, intricacy and fascination. He has also revealed himself in the Person of Jesus. Think for a moment about the appreciation of depth which is contained in a scene viewed with both eyes rather than with one eye, or the depth which stands out in pairs of pictures viewed through a stereoscope. Objects appear solid; estimates of distance can be made. Putting the two revelations of God together is like having binocular vision. A new depth and reality are created in our appreciation of the world around us and of God himself. We also appreciate how much more there is to explore, both in the world and in God.

Notes

1 J. Gleick, *Chaos* (Heinemann: London, 1987).

2 J.T. Houghton, *Does God Play Dice?* (Inter-Varsity Press: Leicester, 1988).

3 *Ibid*, p 127.

4 *Ibid*.