

# The Journal of the Christian Engineers' Association

## CEA Perspective – Winter 2005/6

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## Editorial

John Baden Fuller and David Kay

### Your contributions are welcome

As Editor and Assistant Editor, John and David have both contributed articles to this issue of the Journal and the *review of the issue* is also a joint contribution by both of us. It is sad to note that we have only one other article by a member. We are always ready to publish your contributions. As we stated in the last issue of the Journal, there is always the danger that any issue of the Journal will reflect only the views of the editor and committee. Please send us your contributions for the next issue of the Journal by **1st April 2006**. Details of the mailing address are given on the inside front cover. If you would rather send your contribution by e-mail, please send it to David Kay at the address given there.

### Reviewing the Issue

#### Energy

In this issue we continue the “energy” theme of the last Journal, but on a rather broader basis. There a brief article by David about energy cost comparisons, and renewable energy. In addition, we are publishing a most interesting article about tsunamis by Desmond Scott. Tsunamis, of course, represent uncontrolled release of energy, as opposed to the normally controlled release which characterises traditional power generation. Mike Clifford’s very welcome article on reclaiming technology considers how technological solutions can be made most appropriate to the needs of low-income countries. Some of these solutions relate to energy production. We are grateful to Barbara Brighthouse of *Christian Engineers in Development* (CED) for her article about the Kilolo Sustainable

Development Programme, describing a CED project bringing clean water to 13,000 people in rural Tanzania. We then leave the “energy” theme behind us, but would still welcome your responses to what we are publishing.

## **Science and Religion**

Following, we have two articles to help us understand some of the ideas involved in the “Science and Religion” debate. Our Chairman, John Baden Fuller, contributes an article which deals with the wonderful balance in scientific terms in the natural operation of the world, and how an understanding of this can enhance our belief in an all-loving God.. We are also pleased to be able to publish an interesting article on ‘evolution’ by Denis Alexander. He shows how many scientists are quite happy to be researching the wonders of God’s creation even though an understanding of what is happening relies on accepting a belief in evolution. We hope that engineers have an interest in scientific topics!

## **Only one unsolicited article**

We are delighted to have received one unsolicited article for this issue; Mike Cowan has provided a most welcome article about the outworking of faith. We are sure that other members have thoughts on Christian and/or Engineering subjects that we would be delighted to print.

## **Christian Workplace Forum**

We are publishing information about the work of the organisation *Clapham Connections* in relation to the *Christian Workplace Forum*, with a particular emphasis on its work among Christian students. Our article, though of general interest, should be particularly relevant to the younger members of *Christian Engineers Association*. Ros Turner, of *Clapham Connections*, is liaising with many workplace associations, and we support her work by contributing £50 per annum from our funds. Any members, in touch with engineers facing the transition from university to paid employment, may wish to make them aware of our article. Our aim in life is not to promote the survival of *Christian Engineers Association*, but rather to allow it to develop to serve the needs of Christian engineers. The way forward may well involve a greater emphasis on addressing the interests of younger people, and doing so by writing with their needs particularly in mind.

Finally, a report of our last two committee meetings is included although, as you can read there, the spring committee meeting had to be cancelled due to the illness of two of the members. This highlights the situation that we would welcome another member to come and join the committee. The duties are not onerous as we only meet twice a year!

## **Afterthought**

This is a story about four people named,

*Everybody, Somebody, Anybody and Nobody.*

- There was an important job to be done and Everybody was sure that Somebody would do it.
- Anybody could have done it but Nobody did.
- Somebody got angry about that because it was Everybody’s job.
- Everybody thought Anybody could do it but Nobody realised that Everybody wouldn’t do it.
- It ended up with Everybody blaming Somebody when Nobody did what Anybody could have done!

Anon

# Relative Costs of Energy

David Kay

## The Need to Assess Total Costs

The last issue of the Journal included a ‘nuclear feature.’ There is inevitably periodical debate about the relative costs of different sources of energy. The cost of energy is made up of various components, including:

- 1 The fuel costs
- 2 The design and construction costs of the power station
- 3 The running costs of the power station
- 4 Energy distribution costs
- 5 Waste storage costs
- 6 The decommissioning costs for the whole power station site

Not all these costs are relevant for any one form of energy. Small installations are intended to be included in the broad term “power station”. I have not included indirect costs, such as claims for compensation for injury, and environmental impact.

In comparing the costs of energy sources all these costs should ideally be included. However, some of them are not easily quantified, especially costs associated with environmental impact. Moreover, some costs may change as new information becomes available, or new approaches are adopted. For example, a few months ago it was reported in the media that nuclear clean-up costs had substantially risen, and a more rapid decommissioning programme was being considered. No-one can fairly state that any one source of energy is cheaper than another, without stating also which costs are included, or excluded, in the assessment.

Christians hold dear the concept of “absolute truth” (see Jn.8, v32), which is contrary to post-modern ideas. We come closest to our “absolute” ideal by ensuring we take a broad view when considering energy costs.

## Renewable Energy

This term is frequently used, but how often does one ask what it means? Christians may speak of the “renewal movement”, in the context of charismatic aspects of the Christian life. The idea here is that something has become “old”, and needs to be made “new”, or something has been lost and needs to be regained. The work of the Spirit includes the renewal of our minds (Rom.12, v2), and perhaps even our personal energy levels (Isa.40, v31)! Another word in our Christian vocabulary with a similar connotation to “renewal” is “restoration”. The practical process of renewal or restoration is based on the belief that something is renewable.

As far as energy is concerned, what is “renewable” about renewable energy? When energy has been used for heating purposes, for example, it cannot be returned to its source, whether it originated from a fuel, the sun or the wind. Wind turbines must affect the weather marginally by modifying air distribution patterns. Even though such effects are so small as not to be significant, they still exist. Other aspects, such as the use of energy at the construction stage, are more significant. Thus, we are not getting something for nothing, even with so-called “renewable” energy. The term “renewable” presumably refers to the fact that there is no fuel source that obviously gets used up, when energy is

generated. It is a misnomer; “environmental” or “natural” energy would perhaps be a more accurate term.

As Christians, we should be thankful for all energy sources not requiring fuel, particularly for those which cause minimal environmental impact, but we must not take any for granted. As with energy costs, a broad view is needed, if our desire is to know the truth about this form of energy.

*David Kay is a mechanical engineer. He is a member of the CEA committee and assistant editor of this Journal.*

## Tsunamis

Desmond Scott

Tsunami is a Japanese word which translates as ‘Harbour Wave’. They are sometimes called (by the media) ‘Tidal Waves’ but they have nothing to do with tides. Tsunamis have been occurring since prehistoric times, they are nothing new. The Historical Tsunami Database holds records going back to 47BC. They can be caused by a number of different geophysical events: submarine earthquakes, subsidences or volcanic eruptions, but as the majority of large submarine earthquakes occur in the Circum-Pacific seismic zones, so the coastal regions of the Pacific rim countries suffer most from tsunamis.

The Pacific Ocean with its ‘Ring of Fire’ and deep trenches is far more active than either the Atlantic or the Indian Ocean. Some five or six events of varying magnitudes occur every year in the Pacific, whereas the last major event in the Atlantic was the great Lisbon earthquake in 1755 when some 60,000 people in Portugal and Morocco lost their lives.

In 1960 and 1964 devastating tsunamis generated by earthquakes in Chile and Alaska prompted Member States of the Intergovernmental Oceanographic Commission (IOC) of UNESCO to take steps to establish the ‘Tsunami Warning System in the Pacific’.

IOC took the lead in co-ordinating the efforts of its Member States and in 1965 formed an International Co-ordination Group for the Tsunami Warning System in the Pacific and an International Tsunami Information Centre (ITIC), which for geographical reasons was sited in Honolulu. This is hosted by the USA and the US National Weather Service provides the Director and all facilities.

ITIC’s mandate is threefold:

- i. Hazard Assessment;
- ii. Warnings;
- iii. Preparedness.

**i. Hazard Assessment.** A network of seismic stations has been established in and around the Pacific but not all earthquakes generate tsunamis, and it is impossible to predict a tsunami solely from seismological data. These data have to be supplemented by sea level data from a separate network of tidal stations (some 60 or more in the Pacific) recording the waves as they travel across the ocean at some 400-500 mph.

In deep water the waves are low and can pass unnoticed by shipping, but as they approach shallower depths the waters are held back by friction from the sea bed, they recede and then huge waves develop

and sweep inshore causing widespread death and damage. The short recession period is the clearest indication that a tsunami is on its way and the knowledgeable run as fast as they are able inland and up on to higher ground.

**ii. Warnings.** These are being improved all the time with sophisticated communication systems but the time scale is so short - a wave takes only eight hours to cross the Pacific from Honolulu to the beaches of Japan and warning times are inevitably shorter - and how do you get tourists, uneducated in tsunami matters, to evacuate bars, restaurants, hotels and beaches, or their beds in the middle of the night? There is also always a risk that by sending out warnings at the slightest possibility of an event, one would soon face the risk of shouting 'wolf' too often when the waves turn out to be minimal and of no danger.

**iii. Preparedness.** Education, particularly of locals, in the significance of the sudden recession of the sea and the immediate action that needs to be taken, is essential, but these tend to get forgotten in areas where events are few and far between - the last major earthquake/tsunami in northern Sumatra was in January 1907! The volcano 'Kakatoa' which erupted (and virtually exploded) in 1883 is situated in the Sunda Strait between southern Sumatra and Java.

Two intergovernmental meetings have so far been held (Unesco, Paris, 3-8 March and Mauritius, 14-16 April) to identify 'Progress and further requirements for the development of a Tsunami Warning and Mitigation System for the Indian Ocean'. However, for the above reasons an International Tsunami Warning System for the Indian Ocean, similar to the existing structure in the Pacific Ocean, may be more difficult to achieve.

Japan, USA and Chile (and no doubt other Pacific countries) have large warning signs on display on their beaches, and the populace is more knowledgeable due to the frequency of events.

Although the 26<sup>th</sup> December 2004 event, at 9.3 on the Richter scale, was a major earthquake and tsunami by any standards, it should be realised that the main reason for the huge loss of life it caused was due to the large increase in population in the countries affected, both local and tourist, since those earlier days.

Tsunami events should not be confused with storm surges which are by far the most dominant hazard for coastal areas of the United Kingdom and North Sea, such as the 1953 event which caused huge loss of life on Canvey Island and considerably more in The Netherlands.

Geologists have forecast a major tsunami-generating earthquake for the Canary Islands but with no indication of when - in 2 years or 200 years? - no-one knows. It is certain that there will continue to be large events in the Pacific, for instance in Alaska and the San Francisco Bay area (the San Andreas fault), which are classed as 'potential earthquake sources and hypothetical extreme undersea, near-shore landslide sources'.

*Desmond Scott is a Life Member of UNA and past Chairman of the Chichester and District Branch. After retiring from the Royal Navy Desmond headed up the Intergovernmental Oceanographic Commission of UNESCO for seven years in the 1970s, which was largely responsible for the present Pacific Ocean warning system.*

CEA are grateful to CED for their assistance in making this article available.

# Reclaiming Technology

Mike Clifford

## Introduction

This year, the Make Poverty History campaign has succeeded in bringing poverty to the attention of the general public. Debates over debt relief, farming subsidies, trade barriers and tariffs have occupied many column inches in the Sunday supplements. And thanks to Sir Bob, Live 8 has catered for those with younger tastes. But what should happen next? How can poverty be alleviated? After all, man cannot live on debt relief alone.

In this article, I will attempt to describe the role that technology can play in combating poverty, and discuss the issues we should consider as Christians in implementing technologies in low-income countries. (Incidentally, I was recently told that we should not refer to these countries as “under-developed” since, in many aspects of life, such as family values, countries such as Uganda are more developed in their attitudes than we in the so-called “developed” nations have become).

## Technology – good, bad, or ugly?

Firstly, it is interesting to note that many Christians are uneasy with technology. Perhaps this is because of our traditional conservatism and resistance to change. Some justify their technophobia by the absence of any form of technology in the Garden of Eden and with reference to the first great Civil Engineering failure – the aborted attempt to build a skyscraper to rival even today’s structures (Gen.11). The argument is developed by the judgement of the cities of Sodom and Gomorrah (Gen.19). The failure of mechanical objects to defeat God’s purposes; ‘he breaks the bow and shatters the spear’ (Psalm 46:9) reinforces the position. The God who makes wheels fall off chariots (Ex.14:25) doesn’t exactly encourage engineering.

However, there are Biblical examples of the successful use of technology. These include: the construction of Noah’s ark (Gen.6), the tabernacle (Ex.31), building the temple (1 Kings 5) and reconstruction of the walls of Jerusalem (Neh.3). If technology is a result of the Fall, rather than a root of all kinds of evil, it is, perhaps, necessary for survival.

J.F. Kennedy stated that sufficient technology existed (in 1961) to ‘destroy all forms of human poverty and ... all forms of human life’. Over forty years on, technology continues to be used for both ends although neither outcome has been reached. The fact that human life still endures is testament to the grace of God. The fact that we have failed to alleviate poverty is testament to the failure of engineers to utilise technology to its fullest extent and to the reluctance of governments to support useful research, rather than squandering finite resources on high profile schemes of questionable value. (I leave the reader to decide into which category G.W. Bush’s plan to send a manned mission to Mars fits.)

## The problem of implementation

There are many issues associated with implementing technological solutions to the problems encountered by those living in low-income countries. Imposing solutions from outside of the indigenous culture creates suspicion and risks rejection. Technology must be introduced with the consent and the support of those who use it. More than that, the technology must be understandable and maintainable by people who may have limited engineering ability and available resources. These aspects were highlighted to me not merely through reading textbooks, but by hearing stories of where technology has failed. For example, my secretary has just returned from a holiday in Kenya. There, she visited a remote village where water used to be drawn from a borehole using a hand-operated

pump. However, the pump had broken down and, since the villagers had no spare parts, no contact number, and no resources for repairing the pump, they had no choice but to return to walking many miles to collect water from a distant, polluted source. The technology that had, at first, brought great joy, is now blamed for the return to drudgery. This is hardly a good advertisement for the charity involved, or for engineering in general.

## **Appropriate Technology**

The need for technology to be relevant, understandable, consultative, small-scale, flexible, to use local resources and to be free from patents, was popularised by Schumacher in his ground-breaking book, *Small is Beautiful*. Describing himself as a practical man, Schumacher coined the phrase ‘appropriate technology’ for solutions that are simpler, cheaper and freer than the ‘super-technologies’ of the rich. Attention is often drawn to a chapter entitled ‘Buddhist Economics’ in *Small is Beautiful*. Schumacher admitted to a certain amount of attention-seeking in his choice of title, and many of the values expounded upon in the chapter are equally at home in a Christian ethic. Indeed, although Schumacher explored Buddhism, and was influenced by Gandhi, he affirmed that Catholicism was where he felt most at home and where in his view, the essentials of Christianity are best preserved.

Relating the principles of appropriate technology defined above to Biblical principles is not straightforward. As we have seen, many of the technological challenges described in Scripture are on very large scales: Noah’s ark, building the temple, reconstruction of the walls of Jerusalem, whereas Appropriate Technology solutions are usually small-scale. In addition, none of these projects could be classified as low in capital costs, although local materials were often used. However, in all these cases the emphasis was on the individual. Local skill and labour was used, particularly in rebuilding the walls of Jerusalem (Neh.3). In the construction of the tabernacle, specific tasks were undertaken by Spirit-filled craftsmen (Ex.31:1-11). The status of craftsmen depended entirely on their God-given talents and to what use they put them to. Craftsmen who make idols are described as “nothing but men” who “will be brought down to terror and infamy.” (Isaiah 44:11). God’s concern is for individuals; for the sake of ten people he was willing not to destroy Sodom and Gomorrah; he counts hairs on heads and falling sparrows. The social and economic units that are often encountered in the Bible tend to be the extended family (Josh. 24:15, Prov. 31:15, Acts 16:15,33, 1 Tim. 3:4-5) with the responsibility to provide physically and spiritually for weaker members placed on men and women. By concentrating on small units such as the family, individuals could be known by name and cared for as their needs required. Moreover, Paul placed particular emphasis and value on working with the hands (1 Cor. 4:12, Eph. 4:28, 1 Thes. 4:11) and demonstrated his flexibility in supporting his preaching ministry with practical work including tent-making as the need arose.

God’s special concern for the poor (Deut. 15:4, Psalm 14:6, James 2:5-6) and his desire to alleviate poverty (Psalm 113:7) fits well with the goals of appropriate technology. Although the Bible has no references to patents, Samuel warned Israel that their desire for a king would bring with it royalties in the form of taxation, conscription, and even slavery (1 Sam.10-17).

## **Appropriate Technology Solutions**

Collating and disseminating examples of appropriate technology solutions that work is facilitated by charitable organisations such as Engineers Without Borders, Students Partnership Worldwide, Practical Action (formerly known as the Intermediate Technology Development Group), Tearfund and many others. This is achieved by an increasing use of websites with fact sheets on many aspects of technology: energy production, transportation, water and sanitation, construction, manufacturing, food processing, and so on. Visits to partners in low-income countries enable appropriate technology solutions to be tested and demonstrated, for local knowledge and skills to be applied, and for volunteers to gain a deeper appreciation of the challenges faced by local communities.

A visit by volunteers from Students Partnership Worldwide to Image, in Tanzania, involved building and testing fuel-efficient stoves with different groups of villagers. The stoves used much less

firewood than traditional stoves. Villagers have adopted the new design, and stoves are manufactured *in situ* to generate income, by building stoves for other members of the village, and in nearby towns. Projects undertaken by student volunteers working with Engineers Without Borders include design of refugee tents from readily available materials, optimising cooking stoves, water filter design, hydropower and solar power solutions.

Appropriate solutions can be seen in the area of creating employment in low-income countries. These include setting up small industries such as making soap, bicycles, footwear and furniture, and passenger transport schemes. A key factor in all these cases is the involvement of local communities in decision-making, and the appropriate use of indigenous technical knowledge. It is also important in such situations to try and counteract the perception that goods from abroad are of greater value than locally produced alternatives. This can be difficult in the face of aggressive advertising from multinational companies promoting inappropriate technologies.

### **Information Technology example**

The information technology revolution is an interesting area to consider. In Jordan, for example, King Abdullah has launched a programme called “Big ideas for a little country” which intends to reform the education system by the use of computers in schools. The scheme has backing from US multinational companies, but has faced opposition from within Jordan by those who think that the immediate needs of the country will not be served by education alone. A more appropriate response to the desire for technology has been the development of the ‘simputer’ – a cheap handheld computer developed by scientists and engineers at the Indian Institute of Science in Bangalore. The computer is the first to be designed and manufactured in India and is aimed at providing cheap and accessible computing. Unfortunately, the project has suffered delays and setbacks partly due to the diffidence of computer manufacturers and software companies in the developed world and lack of financial support. An appropriate future scenario is one of mixed technology, where imported high-tech equipment works alongside locally made and maintained technology.

One area that has benefited from the appropriate technology approach is food processing. Although agriculture forms the economic basis for many low-income countries’ economies, the income from primary food products is often unable to provide a reliable livelihood. Alternative or additional income-generating opportunities are needed. One such opportunity is in agroprocessing: turning primary agricultural products into marketable commodities. Practical Action has established small-scale, appropriate and sustainable processing businesses that are flexible, require little capital investment and can be carried out in the home without the need for sophisticated or expensive equipment. In Bangladesh, training from Practical Action and partner organisations in processing products ranging from Bombay mix to pickles, jam, cheese, coconut balls and cake has enabled more than 2,000 businesses to be successfully established or expanded. Similar programmes have been successful in Darfur, Eastern Sudan and Nepal. A key aspect of the training involves identifying and meeting market needs in order to sell products.

### **Conclusions**

The challenge to engineers is to make technological developments instruments of justice, rather than exploitation. Appropriate technology offers engineers (and others) useful principles for development and invention. By carefully balancing the need for innovation with finite resources, and by avoiding the negative effects that change can bring about, through harmonious relationships with local communities, engineering can become a force for good.

*Dr. Mike Clifford is a lecturer in Mechanical Engineering at the University of Nottingham. He is also a volunteer with the Christian relief and development charity, Tearfund. Interested readers may wish to contact Christians in Science ([www.cis.org.uk](http://www.cis.org.uk)), who have published a more detailed article about appropriate technology by the same author.*

# **The Kilolo Sustainable Development Programme**

Barbara Brighthouse

“How can we look at someone who is dying, who has no water, no food, no medicine and say, ‘It’s none of our business’?”

This is the question posed by Archbishop Donald Mtetemela of Tanzania, head of the Diocese of Iringa, revealing his concern for the poor. Its practical outworking is shown by the various projects being run by the Diocesan Development Department.

## **A Christian Engineers in Development (CED) project bringing clean water to 13,000 people in rural Tanzania**

One such project is the Kilolo Sustainable Development Programme (KSDP). CED has been involved in this from the outset, having been approached by the diocese to conduct a feasibility study and help procure funding.

At present the residents of the villages of Kilolo, Lusinga, Luganga and Utengule collect their water mainly from rivers or shallow water holes. This contaminated water is often not boiled before drinking and is the cause of various diseases. In discussing their poverty with the Diocesan Development Officer, Mrs Christine Kalipamwamba, the people realised that one of their primary needs was access to a supply of clean water.

### **Feasibility Study**

The feasibility study was carried out by CED in 2001 and following awarding of funding for the project, a sustainable integrated development programme, which included the provision of potable water supplies and improved sanitation, is now underway.

Water is to be piped under gravity from three springs, situated at an elevation of approximately 2000m in the Lilamgambi Forest reserve, to water tanks located in the four villages. Separate distribution mains will then serve these communities, which have a total population at present of about 9,000, expected to rise to 13,000 in 20 years time.

At each of the three springs, water emerges at the surface over quite a large area, rather than as a point source. As the aim is to collect the water before it reaches the surface and becomes liable to contamination, percolation trenches with reverse gravel filters have been laid. These feed the water into intake chambers and then on to a break pressure tank, required not so much to reduce pressure but because of the difficulty in predicting accurately the amount of water that can be collected at each intake, due to the diffuse nature of the springs.

In total the length of delivery main is about 17 km, with pipes ranging from 4” diameter uPVC to 2” HDPE. Due to the nature of the landscape the pipeline will have to cross several deep gullies. Here galvanised steel pipe will be used, carried over the gullies on brick piers.

### **Local Participation**

For this project to be sustainable, it must be ‘owned’ by the communities it serves. To this end the villagers are expected to provide labour, helping to transport materials to the intake sites and digging trenches for the pipeline. However, because of the distances from the villages to the intakes, transport has to be provided as far as possible. Community members then carry sand and gravel to the intakes

where local technicians carry out the construction work. This is hot and tiring work, and villagers must then return to their communities to perform their normal daily work. Each village has also been responsible for digging their own section of pipe trench. The majority of this has been completed, but in many places the trench will have to be deepened, as rain has subsequently washed some material back in.

## **The Project is Proceeding**

Progress to date has been slow, hampered mainly by transport problems and distances involved. The 3-year project officially began in April 2004, but no funding was received from the EU until September, so little could be done before then. Work on the intakes is almost complete, pipes are in store in Kilolo awaiting laying, construction of the break pressure tank is complete, and the distribution mains have been designed.

Although the most visible part of the work so far concerns the supply of water, the full benefits of the project will not be realised without the health and hygiene promotion and sanitation components of the project. A programme of seminars, including capacity building, hygiene promotion, and HIV/Aids education has already begun and will continue throughout the project. Villagers will be taught how to build pit latrines and will be able to buy subsidised latrine covers.

It is through such projects as these that staff at the Diocese of Ruaha believe that the love of God will be shown to the poor.

The diagram on pages 18 and 19 shows the location of Intakes I and II in the Lilangambi forest.

*CEA are grateful to CED and Barbara Brighthouse for providing this description of some work that CED members are undertaking in Tanzania.*

### **Christian Engineers in Development (CED) offers:**

- Professional engineering services for development agencies, communities and NGOs in the developing world.
- Support and fellowship for all Christian engineers engaged in or enthused by development.

*For more information, or to learn about becoming a member, please visit the website, [www.ced.org.uk](http://www.ced.org.uk), or send an e-mail to, [admin@ced.org.uk](mailto:admin@ced.org.uk).*

## **Science & Religion**

John Baden Fuller

### **Theories about the Origin of the Earth**

When I was at school, we had a very old encyclopaedia which showed an exciting diagram of the planets being drawn out of the sun by some passing heavenly body. *Now* we know that the sun consists primarily of Hydrogen and Helium whereas the earth and the planets consist of about a hundred higher order elements which could not have come from the sun. So *that* theory of the origin of the earth is completely wrong! Then I remember listening to a series of radio programs by Professor Fred Hoyle, the eminent astronomer, on the origin of the universe. He put forward the theory of the continuous creation of hydrogen atoms, to explain the expanding universe. *Now* it is

generally accepted that the big bang theory best fits the available facts about the origin of the universe and Fred Hoyle was wrong. Each of these theories are just theories or ideas which best fit our observations about the universe at that time. They certainly cannot be used to refute what God has told us about the origin of the world in the first chapters of Genesis.

## **Christians are happy to be involved in Scientific research**

Christian thinking was crucially important for the initial development of science. At the reformation, there were many influential scientists who had a strong Christian faith. Although there are now some vocal scientists who attack religious beliefs, it is completely false to suppose that biblical Christianity is incompatible with science. On the contrary, there are many scientists today who have an active Christian faith which is fully integrated with their professional work and study. Denis Alexander, is one such scientist (see p.25).

Engineers do not spend much time thinking about the origin of the world. We are too busy getting on with our job, making use of what we have around us. However, I believe our world is so wonderfully made that it could not just be the result of chance and natural selection. We must have been made by an intelligent creator.

## **There is a creator**

Scientists have discovered an amazing super-intellect which accounts for the elegant harmony of the basic laws of nature. We exist under the balance of the inflationary force of the expanding universe and the force of gravity to one part in  $10^{60}$  which uniquely allow atoms, stars, and eventually, organic life to form. There are supremely balanced correlations between the different elements of the universe which allow the integrated complexity of life to emerge. This does not suggest mere accident. It suggests supreme order. The range of conditions for conscious life forms to develop is extremely small. It could occur by chance over billions of random permutations of possibilities, but the more likely solution is that it was planned that way.

## **The evidence points to God**

Richard Dawkins, in his book, *The Selfish Gene*, shows that each species in nature does its best to secure its survival. However, that is not an adequate argument to disprove belief in a creator God. The wonderful fit of nature shows that our universe is most likely to be the product of an intelligent creator. It is too complicated to be just the result of chance and natural selection. There is much more credulity involved in believing that we are the product of millions of years of natural selection than in believing that we were made by a benevolent God.

Consider a few common examples. Most of us know about the way some plants rely on insects or birds to undertake pollination or to distribute their seeds. The whole food chain shows that all species are completely dependent on many other species. We are constantly being told that we live a very precarious existence. If we disturb the ecological balance of our environment, we may well destroy our habitat. Some have calculated that the earth is in the exact orbit to sustain life and that any other orbit would completely destroy these conditions. Water at normal temperatures and pressures is an almost unique substance on earth. Its solid form as ice is less dense than its liquid form. Ice floats. If it did not, all ponds and seas would freeze solid from the bottom up and most marine life forms would be killed as soon as freezing temperatures occurred. Richard Dawkins uses the example of the cold virus. The cold virus makes us sneeze. A sneeze is the best way of propagating the cold virus. So every species, even viruses, create conditions that ensure its survival.

The best and most rational explanation is that it was all designed. It is just, who do we acknowledge as the creator?

## **The Bible is not a Scientific Textbook**

Remembering that Genesis was written at least 3000 years ago and possibly as early as 6000 years ago, it amazes me how much the order of creation in Genesis 1 agrees with the theories we have that are based on the best scientific evidence. However, we need to remember that Genesis is not a scientific textbook, but a statement that God created the world with its plants and living creatures and human beings. We must also remember that the story given in Genesis had to be written in a way that would be relevant to the people who first heard it. It does not worry me whether God created us all together with fossil records in six human days, or whether he used the process of evolution over millions of years to create the universe we know and think we can describe. The important thing is that God created it all by a process we can only imperfectly understand. To God be the glory.

## **Anti-Christian arguments are wrong**

How can such an intricate mechanism as our universe, leading to ideal conditions to sustain life on earth, be just the result of blind chance and natural selection? As an engineer and a scientist, it stretches my credulity more to believe that, than to believe that our world and its universe was made by an intelligent creator.

## **The evidence points to God as our creator**

Why do atheists and humanists spend so much time and energy trying to convince everyone that God does not exist and that science has proved God does not exist? As scientists discover more of the wonders of our universe, so the amazing intricacy of the whole system points more and more towards an intelligent creator and less and less to blind chance and natural selection.

## **Scientific Theories are Ephemeral; God's Word never changes**

We must also acknowledge that we do not fully understand the first chapters of Genesis with its story of origins and prehistory. But neither can we fully explain the origins of everything by scientific study and observation. As my examples earlier make clear, we can only make intelligent guesses which bring us nearer to the absolute truth. Subsequently, they may well be shown to be partially or completely wrong. So we can never use the latest scientific theory to rubbish anything the Bible says. Scientific theories come and go but God's Word remains for ever. Praise God!

So as we acknowledge the amazing mind of our Creator, we shall need to follow our Maker's instructions.

*Acknowledgement:* This is an expanded version of an article by John Baden Fuller which was first published in the *CEA Newsletter*, Spring 1995.

*John Baden Fuller is an electronic engineer who was a University Lecturer before he retired. He has been chairman of CEA for over 10 years and has been a Reader (lay preacher) in the C of E for over 45 years.*

# **Evolution**

Denis R. Alexander

It all depends what you mean by the term 'evolution'. Charles Darwin published the *Origin of*

*Species* in 1859 as a theory to explain the origins of biological diversity. And at that time, that's all it was – a biological theory, a theory in fact that Christians were quick to baptise into a Biblical doctrine of creation. Asa Gray, Professor of Natural History at Harvard and a committed Christian, had long been Darwin's confidante and organised the publication of the *Origin of Species* in N. America. Christians such as Gray maintained that God had providentially arranged the biological processes of evolution to bring about God's purposes in creation. The Princeton theologian and prominent defender of the inspiration of Scripture, B.B. Warfield, spoke of himself as a 'Darwinian of the purest water'. The British historian James Moore writes that 'with but few exceptions the leading Christian thinkers in Great Britain and America came to terms quite readily with Darwinism and evolution', and the American sociologist George Marsden reports that '...with the exception of Harvard's Louis Agassiz, virtually every American Protestant zoologist and botanist accepted some form of evolution by the early 1870s'.

So given this initially warm reception, why did hostility towards evolution by Christians gain such prominence in the USA a century later, even giving rise to 'textbook battles' in which legal attempts have been made in some states to ban the teaching of evolution in schools? Unfortunately, as often happens with the 'big theories' of science, evolution has become encrusted with all kinds of ideological baggage down the years, 'barnacles' which are not part of the theory itself. Herbert Spencer (1820-1903) was a great populariser of evolution in N. America in the latter part of the 19<sup>th</sup> century (selling 370,000 books), but unfortunately tried to make evolution into a 'theory-of-everything' in which the entire universe was ascending towards ultimate perfection. It was Spencer (not Darwin) who coined the term 'survival of the fittest', a notion that was to be misapplied with such terrible consequences by the Kaiser during the first world war and then by Hitler in the Third Reich.

Today when Richard Dawkins recounts how Darwinian evolution enables him to be an 'intellectually fulfilled atheist', this only reinforces the idea that there must be something deeply anti-Christian about evolution. But the fact that evolutionary theory over the years has been called upon to justify as wide a range of ideologies as communism, capitalism, racism and militarism, some of them mutually exclusive, should alert us to the dangers of extrapolating scientific theories into arenas in which they actually have little or nothing to say.

### **Is it possible to be a Christian and Believe in Evolution?**

So is it possible to be a Christian and believe in evolution? Certainly, as long as 'evolution' refers not to some secular philosophy, but to the biological theory describing how God has created all living things. This explains why the vast majority of Christians who are active in biological research today have no problem with incorporating evolutionary theory within their belief in God as creator. Our task as scientists is to describe the actions of God in the created order as accurately as we can. We are called by God to be truth-tellers. If an evolutionary process provides the best explanation for the origins of biological diversity, then that's fine – it is not our job to second-guess God as to how he should have made things, but to describe what he has actually done.

Evolution combines together two mechanisms: first, variation is introduced into genes (stretches of DNA) by various mechanisms, second, the consequences of these mutations are 'tested out' by the criterion of 'reproductive success', the extent to which mutations impact on the ability of individual organisms to generate offspring. Taken overall, this is a tightly regulated process, as far from the idea of 'random chance' as can be imagined. As the Cambridge evolutionary biologist, Simon Conway Morris, points out in his recent book *Life's Solution – Inevitable Humans in a Lonely Universe* (CUP 2003), if you replay the tape of life again, then what you'll get is something remarkably similar to what we have now. If you imagine the world as a matrix of millions of little boxes representing 'design space', then some of those boxes will get filled up, but not others. Eyes have evolved independently many times during evolution. Such findings are entirely consistent with the actions of a creator God who has intentions and purposes for his creation.

## How ought the Christian to react?

But of course evolutionary processes are not there to teach us morality – Christians are called to behave like children of God, according to God’s moral law, as revealed in the Bible. Conversely Christians should not abuse the Bible by trying to treat it as a scientific textbook, when scientific writing as we understand it now did not even get going until thousands of years after the writing of the early chapters of Genesis.

It is anachronistic to treat Biblical texts as if they were articles out of a contemporary scientific journal. And anyway, if they were, they would soon be out of date! The Biblical creation accounts tell us timeless truths about God’s purposes for his creation in general, and for humankind in particular. It is up to scientists to find out *how* exactly God carries out his creative handiwork.

Some Christians think belief in evolution undermines the uniqueness of humankind and the reality of evil and the Fall. Not so. The Genesis account portrays Adam and Eve as Neolithic farmers. It is perfectly feasible that God bestowed his image on representative *Homo Sapiens* already living in the Near East to generate what John Stott has called *Homo divinus*, those who first enjoyed personal fellowship with God, but who then fell most terribly from their close walk with God (Gen. 3:8). All those who disobey God and trust in their own wisdom in place of God’s law reiterate the historical Fall in their own being (Ezek. 28:11-19).

### **Those many Christians today who are active in the biological sciences worship God for the whole of his created order**

Those many Christians today who are active in the biological sciences are amazed as we uncover more and more of God’s creative actions in our daily research. We do not look for God in the ‘gaps’ in our scientific knowledge, but instead worship God for the whole of his created order, including those remarkable evolutionary processes that God has used for his creative purposes.

*Dr. Denis Alexander is a Fellow of St. Edmund’s College and Editor of Science & Christian Belief, a journal sponsored by Christians in Science (<http://www.cis.org.uk>), an Evangelical Alliance-affiliated fellowship that provides resources, links and support for all those interested in the relation between science and Christian faith. This article originally appeared in the May/June 2005 issue of Idea magazine, published by the Alliance. Readers interested in the follow-up from this article should contact the Evangelical Alliance at 186 Kennington Park Road, London SE11 4BT ([www.eauk.org](http://www.eauk.org)).*

Editorial note: Both *Christians in Science* and *CEA* started as professional groups sponsored by UCCF and still have many common aims and intentions.

## Faith & Negative Feedback

Mike Cowan

As a student of electrical engineering in the 1960s I wisely ensured that I understood the principles of negative feedback, because in those analogue days there would be at least three examination papers each with at least one question on feedback. But it is not just engineers that need to understand feedback and the mechanisms to implement corrections.

The story is told of an American who had purchased a new camper van with cruise control. Having set the cruise control he left the driving seat to make a cup of coffee... A more likely scenario I have

seen is where a company paid commission to their salesmen on the basis of the gross value of the contract, but lacked control of the prices that the salesmen were allowed to negotiate. The result at the end of the year was a £250k loss on a turnover of £2m.

In both cases there was an incomplete feedback loop – the first for the control of steering and allowance for other traffic and the second for control of profit and loss. Two other examples have interested me recently.

### **Who decides the volume of the PA in your church?**

A seminar I attended recently was well presented and emphasised the need to control inputs to avoid distortion, frequency imbalance, and imbalance between the various instruments and vocals. The presentation and the discussion following was somewhat ambiguous about control of the total output volume.

Feedback was to be supplied to the musicians via monitors so that they could adjust their sound level to their (subjective?) judgement, but responsibility for the final output was unclear. If the musicians are accustomed to high volume then the congregation may be subjected to what I have heard described as ‘the tyranny of the worship group’. As an interested customer and not an expert I don’t have a simple answer, but I can suggest some areas for improvement.

- 1 Arrange areas of different ‘field strengths’ within the building so that members of the congregation can choose the volume level they prefer. The outcome might provide some helpful and unspoken feedback.
- 2 Gather spoken feedback from members of the church who are prepared to be objective about their subjective opinion.
- 3 Find, or carry out, some research of the full safety issues. The legal 120dB limit may be too high for small children and is uncomfortable for those unused to modern discos.

### **Why don’t The Americans react to Global Warming?**

I did consider writing an article entitled ‘A generous God in a finite world’. Those who were young when TV started in the UK will be familiar with those Hollywood Westerns in which a whole continent was there to be taken. I believe that the philosophy of those films has crept into the ‘prosperity teaching’ of many USA preachers.

If I believe solely in an infinitely generous creator I might be unable to hear the warnings being given by a finite creation. The individual signals claimed to indicate global warming may be challenged, but across the spectrum of those signals is a harmony that points to the abuse of our world. Teachers of prosperity would do well to study the story of The Prodigal Son who did, indeed, have a very generous Father.

### **A conclusion**

Did you know that our Creator promises to provide us with negative feedback when we ‘cry for help’?

Isaiah, in Chapter 30 verse 21 describes it this way: ‘Whether you turn to the right or the left, your ears will hear a voice behind you saying, “*This is the way; walk in it*”’.

*Mike Cowan is an electrical and mechanical engineer and a member of the Institute of Quality Assurance. He is married with two adult children.*

# Christian Workplace Forum

Ros Turner

A year before the *Christian Workplace Forum Core Group* (CWFcg) was formed, *Clapham Connections* Ministry at Moggerhanger began contacting leaders of Christian associations in the workplace, and brought them together to discuss a vision for changing the values of the nation through workplace associations, and to talk about life in their particular sphere of work. The *Christian Workplace Forum* (CWF) was formally established on June 28, 2004, and is a project of *Clapham Connections*. Ros Turner is the CWF Co-ordinator.

A link was formed in May 2004 with the largest Christian student work in the UK, the Christian Union movement formally known as *UCCF*. The main objective is to liaise with key workers in UCCF and raise the profile of *Christian Workplace Associations* (CWAs) within the organisation, and also highlight the importance of CWAs in supporting graduating students when entering the workplace. To-date there are five CWAs with part-time graduate workers.

There are twelve leaders of CWAs represented in CWFcg who have expressed a commitment to the vision, and the out-working of an implementation strategy. CWFcg has also given much time to the creation of *transform-uk*, which seeks to utilise all Christian organisations to mobilise Christians to action. There has also been a continued networking with Christians in the workplace, as a number of small informal meetings were facilitated where CWA leaders looked at good practice models of success and discussed applying them to their association.

During last year a vision was presented to CWFcg of having a Christian Careers Conference for sixth formers that has an unashamedly Christian ethos and would involve as many CWAs as possible, giving first-hand stories and advice of working life as a Christian in a particular career. This vision turned into reality with the help and input of several CWAs; *Faith In Work* took place at Manchester University on June 21, 2005, with 60 students and the involvement of over 20 CWAs. This was the first such conference to take place in the country and, although it is viewed as a pilot scheme, it has potential to develop as the momentum grows and other conferences are planned across the UK in the coming year.

CEA was represented at this conference by committee member Chris Rasiah, who spoke in several discussion-based seminars with pupils about life as a Christian working in engineering. He was able to show how the CEA network had supported him through his career when moving to different parts of the country and how the knowledge of knowing other Christians in engineering brings a confidence in the workplace. Chris also shared how the school subjects he was good at and enjoyed are the ones he is now using in his daily working life, i.e., is using the gifts God has given him. Apart from serving the pupils it was a great opportunity to network with other Christian Workplace Associations, and to receive encouragement and support too.

'*Faith In Work*' and the growing work amongst the students is a very practical way CWAs can show their relevance and uniqueness in serving young people and students today. It has also been a great means for focusing each CWA to think through its own aims and objectives:

- What are we doing and why?
- How do we help our members and colleagues?
- How are we making a difference for Christ at work - or are we just another club?
- How can we be relevant not just to people already in our career but also those wanting to enter into our sphere of work?

One of many exciting developments is Clapham Connections' plan to present seminars at future Christian Resources Exhibitions. We shall be reporting in a later issue of the Journal how this work is continuing to develop.

*Ros Turner is employed by Clapham Connections as the CWF co-ordinator.*

## **Committee Report**

John Baden Fuller

### **Only one meeting this year!**

The committee met last April which was too late for a report to be included in the Summer issue of the Journal. So this time we should have a report on both the Spring and the Autumn meetings. Unfortunately, two members of the committee were unable to attend the scheduled meeting in October due to ill health and the meeting had to be cancelled. David and John had a long telephone conversation, discussed all the items needing a decision, and decided that we did not need to meet until the spring. We hope to hold the next quorate committee meeting sometime in February or March.

### **Christians at Work**

One of the items that regularly appears on our agenda is the *Christians at Work* Annual conference. You will have had the opportunity to read about the conference in the *Christians at Work* literature which you ought to be receiving regularly. This year we were not invited to recommend a speaker for one of the seminars, as we had been for some previous conferences, but it was noted that one of the scheduled speakers is an Engineer. Unfortunately, all members of the committee had prior engagements and were unable to attend, and we believe that no members of CEA attended that conference. One of the advantages of affiliation to Christians at Work is that we can use the Annual conference as a time to meet together. If no members attend, the committee are at a loss to know how to proceed! However, we did decide to plan to seek to be involved in the 2006 conference, providing a 'Caring and Sharing' slot and, if possible, a seminar speaker.

Because CEA members are sent most of the Christians at Work literature quarterly, it was agreed that engineers who are Associate members of Christians at Work should be offered CEA membership for £5 p.a.

### **Student related activity**

Because CEA was started by the *Universities and Colleges Christian Fellowship* (UCCF) as a professional group within their provision for Christian graduates, we continue to be represented on the *UCCF Professional Groups Coordinating Committee*. This meets approximately once a year and provides a forum for similar professional groups to share encouragement and pool ideas. We are particularly interested in supporting Christian students and helping their transition from college to regular work. A newly formed forum to coordinate workplace ministry is the Christian Workplace Forum (CWF) which we have decided to participate in and support. There is an article about CWF on p. 31 of this issue. We contribute £50 p.a. from our funds to the cost of employing Ros Turner, the CWF coordinator. CEA committee member Chris Rasiah participated in the CWF schools careers conference, *Faith in Work*, as the CEA representative. Chris has also been active in relating to some of the Christian students at Imperial college.