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FAITH AND THOUGHT

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A Journal devoted to the study of the inter-relation of the
Christian Revelation and modern research

A G M

The Annual General Meeting of the Institute for 1983 was held in the Hudson Lecture Theatre, Chelsea College, 552 King's Road, London, S.W.10, on Saturday, 21st. May, 1983 at 10 a.m. Prof. R.L.F. Boyd, Vice-President, took the chair.

Apologies for absence were received from the President, Prof. D.C. Burke, Mr. P.E. Cousins, Mr. P.T. Keymer, Mr. T.C. Mitchell, and Mr. G.W. Robson.

The Minutes of the AGM held on the 22nd. May, 1982 were read and adopted.

On the nomination of Council, the President, the Vice-Presidents, and the Honorary Treasurer were re-elected for further terms of office.

Mr. M.W. Poole, Dr. R.E.D. Clark, and Mr. G.E. Barnes, who formally retire from Council, were re-elected for a further period of service.

The Treasurer presented the Annual Accounts and the Auditors' Report for the year ended 30th. September, 1982, and these were adopted *nem. con.*

Messrs. Benson, Catt & Co. were re-appointed as Auditors.

The Chairman of Council gave a brief informal report.

CHAIRMAN'S REPORT

The Chairman started by saying that his Report this year would include several very encouraging items.

Firstly, the Council had been able to appoint a new Editor to succeed Dr. Robert E.D. Clark. He is Dr. Brian Robins, shortly due to retire from cancer research work. He would assist Dr. Clark in the editing of *Faith and Thought*, Vol. 109, No. 3; and would then assume full responsibility for Vol. 110. The Chairman expressed the Institute's gratitude to Dr. Clark for his faithful service as Editor over many years, including lengthy periods of poor health of both his late wife and himself. The Chairman also thanked Dr. Robins for his willingness to serve the Institute; and wished him every success in his new undertaking.

Secondly, he was pleased to report that the Institute's charitable status had at long last been restored, and that this had enabled the Institute to recover income tax paid during the last five years. He reminded members that, by paying their subscriptions under deeds of covenant for four years, they could significantly increase the Institute's income by recovery of tax.

Thirdly, the Council had decided that, because of the large sum recovered from the Inland Revenue, it may not be necessary to increase subscriptions at the end of this year. It was pointed out that the subscriptions currently paid by Associates do not fully cover the cost of producing and mailing their copies of the Journal. This meant that other members were subsidising the Associates to a small extent. Council felt that Fellows and Members would agree that such a subsidy was well worthwhile, to help those who could particularly benefit from membership and who could least afford to pay for it.

Fourthly, the Chairman reported that the Institute's publicity campaign was proving very successful. The new brochures were being distributed widely by mailing the appropriate Christian magazines and also through old students' associations of theological colleges. As a result, the Society had in the last six months gained a nett increase in membership of 43, including nine new members overseas. He again appealed to members to use the brochures and complimentary back numbers of the Journal to interest friends and colleagues in the Institute's work.

Fifthly, two changes in Council membership were reported. Prof. D. Burke, who had recently left the UK to take up an appointment in Canada, had resigned; and Dr. Brian Robins had been co-opted by the Council to fill a vacancy. Formal ratification of this appointment in accordance with the Constitution would be sought at the next AGM.

Sixthly, the announcement of the 1983 Prize Essay Competition under the provisions of the Rev. S. Runsie Craig Trust, specifically to encourage young writers, had elicited no less than 23 enquiries for further details. The closing date for entries was not until the 31st. August, 1983, so it was too early at the present time to judge the success of the Competition.

Lastly, the Chairman announced that Prof. D.M. MacKay had been awarded the Langhorne Orchard Prize for 1982, and that the Prize had been presented at a public meeting at Manchester University under the Institute's auspices on the 14th. March, 1983, when Prof. MacKay had given a lecture on *Science and Religion - where are we now?* The meeting was well attended, particularly by young people who contributed to a lively discussion following the lecture.

CONFERENCE

The annual conference of the Victoria Institute was held on Saturday 21st. May at Chelsea College, London. This year's programme took the form of a symposium on HISTORY AND THE CHRISTIAN FAITH.

Dr. E. Ives of Birmingham University gave the first lecture, under the heading of the symposium and offered a perceptive analysis of the relationship between the attitude and task of the prophet compared with those of the historian. Although God reveals Himself in history to the prophet, the historian cannot interpret history in the light of God's purposes, in his role as historian. The latter is engaged primarily in solving problems by the analysis of empirical data much as the scientist is. Unique events, (for example, miracles) are not accessible to historical investigation; nevertheless, the historian who is a Christian must allow for the possibility that God may act in a unique manner.

Mr. A. Millard of Liverpool University spoke on *The Old Testament and History: Some Considerations*. His thesis concerned the historical context of ancient inscriptions. He reminded us that modern distrust of ancient writers has repeatedly been shown to be unfounded. Since the O.T. has a religious rather than a historical purpose, factual evidence has sometimes been presumed to have little importance. This is in contrast to the ready acceptance of accounts written by vain-glorious Assyrian kings, of conquests favoured by their divinities.

Then, too, O.T. miracles did not evolve as saga or myth over long periods of time: the religiously conscious were aware, at the time, of the 'miraculous' content. The writers' theology was important to them and must be respected by the historian.

Some Aspects of the Biblical View of History was the title of the lecture by Professor I.H. Marshall of Aberdeen University. We were warned to avoid superficial harmonisation — is there a single view of history held by all the Biblical writers?

The significance of past and future history was at one time revealed to Biblical prophets: who is now qualified to interpret history as they did? Such understanding of the divine purpose may come by revelation obviously, but also perhaps by contemplation of events in a right frame of mind (or heart?).

What in fact is prophecy? Is there a divine timetable — bits of which were revealed to the prophets? The Bible does not represent all actions as fore-ordained. A computer chess program would not restrict the game to a single route but would have resources for every contingency. Perhaps this is how we should view the divine process in history.

Dr. D. Bebbington of Stirling University gave the final lecture, on *History for Theology and Mission*. He welcomed the current decline in 'Church' history, which has characteristically been filtered out of general history, to the detriment of both. In addition, it is being increasingly recognised that value-neutrality is a myth. History can be written only by those committed to a predisposing perspective. This means that, as well as relative interpretations by Marxists or sociologists, Christians can give their interpretations of history in terms of the providence of God. Indeed, Christian insights into the nature of fallen man, can make sense of situations otherwise anomalous.

A Christian interpretation of history gives a world-view within which to evaluate postulates like the (inevitable) perfectibility of man. It also helps us to avoid wrongful denigration of the present by comparison with a romantic past 'Golden Age'.

Finally, it commends realism by reminding us of the sovereignty of God in history and the certainty of ultimate righteousness, even in contemplation of the Jewish holocaust.

The conference was very ably chaired by Dr. B. Stanley of Surgeon's College.

D. BURGESS

EDITORIAL

We congratulate our former President, Sir Robert Boyd, Professor of Physics, University of London, and Director of the Mullard Space Science Laboratory, on his knighthood conferred in the recent Queen's Birthday Honours list. Congratulations, also, to Dr Gareth Jones on his appointment to the Chair of Anatomy,

University of Otago, Dunedin, New Zealand.

Readers will be saddened to hear of the death, on his 80th birthday, of Mr Harold L. Ellison who joined the Institute in 1944 and was appointed an Honary member in 1976. As a converted Jew Mr Ellison had an excellent knowledge of rabbinics and his knowledge and advice, made freely available to the Institute, was much appreciated. We extend our sympathy to his family, and in particular to his second wife who has looked after him in his declining years. His daughter Dr M.L. Ellison is a Fellow of the Institute.

This is the last issue of Faith and Thought to be edited by me. From now on Dr Brian Robins will be taking over. For the time being, however, Dr Robins has asked me to continue to edit the News and Views section.

Erratum

The statement on p.8 this VOLUME that 3½% of our electricity will be derived from atomic power stations by the turn of the century is wrong. The present figure is around 13% and estimates for the turn of the century are much higher than this, some as high as 50% (From Professor F.T. Farmer).

News & Views

MODERN WAR

"Each war raises the level of man's inhumanity to man one more notch" writes Mr E.J. Mann (*Times*, Letter, July 1982). In their war with Iraq the Iranians have sent thousands of child soldiers, many of them 9-year olds, into battle after a military training lasting only 2-4 weeks. They are trained to shout and run across the mine fields to explode the mines and are given hand grenades to throw at tanks. Iran refuses to take back survivors who are captured.

Cruelty to animals is also involved in war preparation. In America great numbers of dogs, goats and pigs have been lined up and fired on with rifles and hand guns to advance "wound research". A new military research establishment was recently about to embark on the destruction of scores of animals by high velocity rifles when the fact became publicised and a ban imposed (*Times*, 30 July 1983).

In the 1970s, when the possibilities inherent in recombinant DNA became obvious, Erwin Chargaff drew attention to possible great dangers ahead (this JOURNAL 103, 68). By accident, or design, new genes might be created which, should they infect the human organism, might cause death on an unparalleled scale. Codes of safety were worked out by the leading authorities in this line of research and it was said that the dangers had been much exaggerated. Since then researchers have been increasingly free to pursue their researches as they see fit.

We learn now that the US Army intends to expand its biological warfare research programme. It is considering the role of recombinant DNA in the development of biological weapons. As usual in such cases the Army says "Our research is, and will continue to be, limited to developing protective measures to recognized infectious agents which pose a biological warfare hazard." But this statement probably implies that biological weapons will be devised so that antidotes may be found. Further confusion arises because the chemical structure of many toxins is now known so that despite the original biological origin of toxins, they may now be embraced within the chemical field and studies of chemical weapons are not prohibited. (*Nature*, 297, 615; for an informative article on chemical warfare see T.D. Inch, *Chemistry in Britain* 1983, 19, 648. The most toxic chemical listed by Inch is *Staphylococcal enterotoxin B* which is active in a dose of 0.04 microgram per kg body weight.) The USA National Institutes of Health (NIH) have not banned the making of biological weapons by molecular cloning but claim that no such work is being undertaken (*Nature* 297, 527; 298, 111); it has been pointed out that such use of biological weapons would contravene the 1972 treaty but that defensive work along these lines is not banned.

The atmosphere of fear and distrust in which men live has been well exemplified by controversy about the nature of yellow rain, supposedly used as a poison 'gas' by the Russians in SE Asia and Afghanistan. The American Government (State Department) claims that it consists of poisonous toxins made by the Russians in violation of two treaties prohibiting the use of chemical weapons. The toxins are said to be mixed with pollen to ensure that they are inhaled by those attacked. Professor Matthew Meselson of Harvard on the other hand claims that the yellow rain is or may be entirely natural in origin and is excreted by bees on the wing — bees at Harvard have deposited a similar material. The State Department it appears is now merely repeating its original allegations but with increasing anger. (*Nature* 302, 200, 303, 457, 9th June 1983; also *New Scientist*, *Times* etc.)

The nuclear arms race was discussed for three days at the York meeting of the British Association in 1981. "One of the themes that practically all speakers in the three days of discussion espoused was that scientists and technologists are one of the most important driving forces behind the arms race" says the *New Scientist* report. Military scientists, said Frank Barnaby (retired director of SIPRI) "are developing weapons which seem as suitable for *fighting* rather than for *detering* a nuclear war... the day is coming when one country might hope to destroy its enemy's nuclear retaliatory capability by striking first." E.P. Thompson attacked the theory of deterrence with the words: "While postponing war, it postpones also the resolutions of peace" (*New Scientist*, 10 Sept 1981).

If atomic war should come, who — or what — should decide to press the button? Warned of approaching missiles the President of the USA would have 15 minutes to make his decision. In those minutes he will receive contrary and varying advice from many VIPs and will need confirmation from numerous sources that the attack is really impending. Awakened, say, in the middle of the night, who could stand the strain? So the argument is now being bandied around that decision should be left to technology. This argument — LUA (launch under attack) — once regarded as crazy now enjoys respectability in Washington and Moscow. A machine will press the button: not a human being. Aeroplanes fly thousands of miles under automatic pilots, so why not trust the future of the human race to machines, seeing that they are, or might be made, more reliable than a tired brain faced with a quick decision? (*Nature*, 298, 695-696).

We are far from having heard the last of the Falklands War. Some of the ships that left Portsmouth in April 1982 carried nuclear weapons as did those which sailed from Gibraltar at the end of March. Some of the weapons on board the ships were removed by air but not all. Nuclear devices were present on HMS Sheffield and HMS Coventry which were lost and oil rig recovery vessels were sent to retrieve them if possible, but there is no news as to whether they were

successful. No fewer than three helicopters carrying nuclear depth charges were also lost in accidents and sank in the sea. "Heaven knows what pollution of the oceans is occurring in the form of emission of radionuclides and building up in the various food chains in which plankton play a part" writes Tam Dalyell (*New Scientist*, 24 Mar 1983). But as he points out worse could have happened. The nuclear powered SSN Conquerer which sank the Belgrano was afterwards depth charged for two hours. Had she been damaged or sunk enormous pollution of the sea might have resulted.

It is often said that you cannot win a modern war. The Falklands war, in which no atomic weapons were used appeared to be a notable exception. But the Argentine government has not signed a peace treaty and is now paying a Swiss firm more than 100 m dollars to develop the *Telemine*, a remotely controlled torpedo. This is no larger than a conventional torpedo but lies on the sea floor for up to two years until required. At a signal, propagated by sound, it rises to just below the surface and travels at 35 km/hr for up to 100 km, then, when very near a target it rises till a TV camera is clear of the water, transmits pictures of the target to a high flying plane or distant receiving station where decisions are made about steering instructions, after which it locks on its target. Ten Telemines a month will be in production in the spring of 1984 after which 25-30 a month will soon be available. All ships visiting the Falklands will be endangered, but Argentinian vessels will always be clear of the exclusion zone. To counter such a weapon if it can be countered, will obviously prove difficult and expensive (*New Scientist*, 31 Mar 1983, p.869).

Another development is the preparation of ferrite paints, able to absorb short waves, which makes detection of missiles and aircraft by radar much more difficult. The Japanese claim to be ahead in this line of research in which the USA is also interested.

EARLY GENESIS AGAIN

Books about the early chapters of Genesis are appearing in considerable numbers. Some of these are by Christians and, when not liberal in tone, they often tell us that we must give up all attempts to reconcile the teaching of Genesis with the findings of science. Instead we should return to the views of our forefathers, who claimed that the earth and the heavens were created in six literal days only a few thousand years ago, that all death including that of animals was the result of Adam's Fall and that the Flood covered the entire earth. This teaching, not unnaturally, offers a heaven sent opportunity to the enemies of Christianity. So they too are writing books to prove that the Bible which makes such claims cannot possibly be taken

seriously. Poetic, it may be, but true it most certainly is not. So effectively have the fundamentalists of America monopolized the word "Creationists", that it is now widely assumed by non-Christians that all Christians who believe that God created the world must reject the discoveries of science and must agree with the American fundamentalists for whom as George Marsden (Review of D. Nelkin's *The Creation Controversy*, Norton 1983; *Nature*, 302, 729) "creation" simply means "a young earth and explanation of geological evidence by a world wide flood".

To be sure the effects of Christian antagonism to materialistic evolutionary teaching in American schools has been highly beneficial. Failure to enforce by law that equal time and textbook space should be devoted to evolution and so-called "Bible science" will still leave publishers more sensitive to the views of Christians while students generally will be, and now are, less inclined to accept as gospel what they are taught.

In the UK the views of "Creationists" seem to be making headway. I watched Dr Monty White on TV dealing with a class of boys, one of whom had asked how it was on Biblical grounds that animals killed one another. The answer came pat that it was because of Adam's sin. Francis Hitching's *Neck of the Giraffe* devotes considerable space to reproducing arguments and cartoons from America directed against evolution. A more dangerous book is Isaac Azimov's *In the Beginning: Science faces God in the Book of Genesis* (PB, New English Library, Dec 1982, £1.75). Here, again, it is assumed that belief in creation implies the American Bible-Science version: this enables the author to go through the early chapters of Genesis verse by verse pitting much of its alleged teaching against the findings of science.

Foremost among UK Evangelicals who uphold American ideas of "creation" is Nigel M.de S. Cameron whose book *Evolution and the Authority of the Bible* has just appeared (Paternoster Press, 1983, 123pp, PB, £3.20).

In reviewing this book, one thinks of our Lord's teaching to the effect that every scribe, trained for the kingdom of Heaven, brings out of his treasure things new and things old (Mt. 13:52) Things old, I take it, are for newcomers to the Christians faith, while things new supply old stagers with fresh spiritual food. In Dr Cameron's book, alas, there is nothing new - as indeed he is honest enough to admit.

One had always imagined that educated fellow evangelical Christians were acutely aware of the utter perversity of former generations of Christians (often falsely so-called) in their attempts to interpret the Holy Bible. The Bible was used to support the Crusades and participation in war generally, extreme sabbatarianism, the burning to death of so-called heretics (justified by reference to Jn.15: 6!), slavery, and the eternal torture of infants who had

died unbaptized even if they had had the misfortune to die before being born, (Aquinas entertained the more kindly thought that the agonies of the unbaptized might be mental and spiritual only, but the agonies were real enough and the Limbo where they dwelt was part of Hell.) And so on. Interpretations of early Genesis were often no less perverse: they owe much more to pagan mythologies than to the Bible (cf. Milton's *Paradise Lost* with its "Flow'rs of all hue and without Thorn the Rose." See this JOURNAL 107, 88f) Cameron forgets all this. Three times over he quotes E.L. Mascall to the effect that in the past all Christians held that man's Fall brought death to all creation. (Not so, says David Clines, see this JOURNAL 107, 88) Christians who are now doubting it are disloyal to the Word of God. It is so obvious that the text of Genesis means exactly this. At all costs the precious baby of Christianity must be kept alive together with every drop of the dirty bath water. Now, if ever, thinks Cameron, we must fight our holy war.

The holy war for which Cameron opts is a war against evolution because (I suppose) evolution teaches struggle and death as the price of progress. The Bible on the other hand teaches that death is the result of man's sin. How so, seeing that the skins of dead animals were available even in the Garden of Eden at the time of the Fall? Gen. 3:21.

Dr Cameron is a 'young earthist' — the universe was created out of nothing only a few thousand years ago because that is what the Bible teaches (does it?). There was no Big Bang because the Big Bang boys (not all of them by any means!) claim that the universe is cyclic so that the Big Bang did not happen at the beginning of time.

Cameron is disdainful of "harmonisers" — those who seek to reconcile the findings (or hypotheses, if he prefers) of science with the Bible. Apparently with the object of discrediting them he examines some of the efforts which were made along these lines between about 1800 and 1900 AD — at a time, in short, when many relevant sciences (eg geophysics) had hardly begun to exist. He dismisses suggestions made in that era as vague. I see no sign of research in this survey which is easily available elsewhere (eg in Bernard Ramm's *Christian View of Science and Scripture*, also published by the Paternoster Press!) A survey covering the present century, or say post-1950 might have been more relevant. Apart from this the author is surely well aware that many Christians interpret Genesis in ways very different from his, yet he completely ignores such writers as J.H. Kurtz, P.J. Wiseman, H.J.T. Johnson, Victor Pearce (*Who was Adam?* Paternoster Press again!), Derek Kidner, Dan Wonderly and G.R. Morton (a competent oil geologist who has now abandoned his earlier attempts to support the young earth theory because he is now convinced that the facts point decisively against it!)

It would have been helpful to learn why Dr Cameron thinks it is more spiritually helpful to think of a universe a few thousand rather than a few thousand million years old but also created by God, or why he thinks that the writers we have mentioned are all using false arguments, and what the fallacies are.

The author holds that scientific controversy about Genesis tends to ignore "deeper theological and biblical questions". Quite so. We need to study God's word afresh, confident with George Rawson that

The Lord hath yet more light and truth to break forth from his word.

Alas this book represents a sad fall from former standards set by the Paternoster Press. The "deeper theological and biblical questions" referred to seem singularly lacking. The book is almost humourless, doctrinaire, repetitive and dull. There is no index or bibliography and the price is high. Give it to a young Christian and he might, for a time, become as doctrinaire as its author. If, later, he studies at college or university a reaction might well set in: he may come to think that Christianity and science are incompatible and bitter antagonism to religion may develop. I have seen it happen as a result of the very teachings which Cameron espouses.

With reference to books on Genesis there can be few indeed as helpful as those of the late P.J. Wiseman. It is good news to learn that his two books, bound in one, are now available from the IVP Press, for £1 post free. (For review see this JOURNAL 104, 176).

DISHONESTY IN SCIENCE

Fraud and Secrecy in science have been discussed this year (1983) at the American Association for the Advancement of Science. Examples were cited of the great hold-ups in the rate of advancement of knowledge as a result of secrecy, especially in connection with military work. Science in the past has depended on the effectiveness of self-policing to avoid dishonesty, but all the methods used seem to be failing disastrously. Many leaders of research teams put their names on the papers published when they have not themselves done much or any of the work. Science being a career junior researchers are tempted to invent data which will please their chiefs. There are far too many vanity press journals, largely unread and unreadable, in which plagiarism is surprisingly easy and rarely detected. Nicholas Wade in *Betrayers of the Truth* has collected much information on the subject. Picture the bright young researcher working in a large laboratory with little supervision but under pressure to be productive. At first he is tempted to cut the corners, later he

concocts results to please his superiors. This, we are told, is the usual story of fraud in science. But not always. Dr W.S. Aronow was head of the cardiovascular section of a leading hospital in California, the author of innumerable scientific papers, consultant to 21 scientific journals and principal investigator to the Food and Drug Administration (FDA): potentially he was responsible for the well being of thousands of heart patients. He had reached the top of his ladder, had nothing to gain but everything to lose. But a junior investigator in the FDA found that on several occasions he had been dishonest in the evaluation of clinical trials of drugs submitted by drug companies. (*Nature*, 302, 558, 560).

The *New Scientist* for 7 July 1983 contains several articles dealing with computer thieves who are now believed to be stealing money at the rate of £2500 million a year. Computing is being taught at schools and colleges and inevitably the know-how of dishonesty is spreading. A Lecturer at Thames Polytechnic set an examination question on how to break the security system on a Digital Equipment Corporation minicomputer and alter examinations results which were stored there. The student who awarded himself 100% was later given a job with a computer firm, the Digital Computer Corporation still maintaining that its equipment was fool proof (p.12)!

ARGUMENT FROM DESIGN

Ever on the look out for new ways of discrediting Christian (or other) belief in God as Creator, the *New Scientist* has published an attack on the common argument based on the fact that, left to chance, the probability that the universe or life would have come into being by chance is zero or *very* nearly zero. (Ralph Estling, "The Trouble with thinking Backwards", 2 June 1983 619-621). That Lecomte du Nouy, John Eccles, Karl Popper, Sir Fred Hoyle, Francis Crick, the supporters of the anthropic principle and many others have taken kindly to the idea is attributed to their stupidity.

The argument Estling uses harks back to Jacques Monod's *Chance and Necessity*. "Among all the events possible in the Universe" says Monod, "the *a priori* probability of any particular one of them occurring is next to zero. Yet the Universe exists; particular events must occur in it, the probability of which (before the event) was infinitesimal... Destiny is written as and while, not before it happens."

So, the probability that every single stone or chip on the moraine of a glacier is exactly where it is, and of the size it is, is effectively zero. But the stones are all there on any glacier you name and without a doubt the astonishing improbability has been achieved, not by the thoughtfulness of God, but by chance. Once such

an improbable event has happened "the odds in favour of it *having happened* are 100 per cent. This seems rather obvious to the point of idiocy, but that fact does not necessarily rule out the possibility of a good many people, including some eminent scientists, overlooking it" says Estling.

Apply this argument to a University, the works of Shakespeare, the parts of a car or the fundamental constants of nature and the fallacy is obvious. No one is interested to learn that, say, the probability of the molecules of air in a room being where they are at noon, on a particular day is $10^{-40,000}$ or what ever the figure may be. We are only interested when the immense improbabilities correlate with meaning, with ingenuity, perhaps with a sense of beauty or with making possible some new development in the affairs of man, or the universe at large. A random arrangement of millions of letters of the alphabet together with blank spaces will always have a near zero probability but only a minuscule proportion of such arrangements will create a work of literature. What matters is the ratio of the overall improbability to the number of arrangements which can be construed to have meaning of some kind. Both observation and calculation teach us that as overall probabilities approach the zero mark, so the ratio of those which are meaningful to the total possibilities becomes less and less till it too is scarcely distinguishable from zero. This is the basis of the argument from design. To conclude, we may well repeat Estling's words: "This seems rather obvious to the point of idiocy, but that fact does not necessarily rule out the possibility of a good many people, including some eminent scientists (as well as Mr Estling), overlooking it." As might be expected correspondence followed Estling's article.

DREAMS

The *New Scientist* for 9 June 1983, p.692, contains an interesting article by Morton Schatzman, a psychologist, on the solution of problems in dreams. A number of examples (several taken from William C. Dement's writings) are cited of which the following are typical. Five hundred students at Stanford were given the letters OTTF and asked to give the two next letters in the sequence. The students were requested to record any dream that they experienced that night. Only nine students solved the problem, seven of them as a result of dreams. A typical dream was as follows. The student was walking down an art gallery and as he walked he counted the paintings, one, two etc. but the sixth and seventh paintings had been ripped from their frames. Suddenly he saw that this gave the clue, the letters are the first letters of the digits and six and seven, beginning with S, S are the next in the series.

Again, students were asked to consider the letters HIJKLMNO and told that the solution is one word. One student dreamed persistently

of water -- shark hunting, diving, heavy rain and sailing into the wind. The answer is water because H to O or H_2O is the formula of water.

If often seems as if some part of the dreamer's mind knows the answer but plays hide and seek with him. This, like so much else at the psychological level, would seem to prove that man's mind is not a unity and that the lack of unity extends far beyond the moral and the spiritual. If man's mind is made in the image of God, then we may suppose that God's nature is also divided so that in the one God there can be communication between one part and another, one part perhaps withholding information from another. (Compare the NT teaching that the Son does not know when the end will be, but the Father does know. In Jn 16:13-14 the Holy Spirit does not speak from himself but passes on to believers what he hears Jesus saying).

New Scientist readers were asked to report on their experience of problem solving in dreams. Another interesting article on the subject appeared in the issue for 11 Aug.

ALCHEMY AND PANTHEISTIC MYSTICISM

Ellen Myers has written an interesting article on alchemy and mysticism. Following R.K. Merton (*Social Theory and Social Structure*, Glenco, 11 Free Press, 1957, Ch.18) it is argued that alchemy should not be regarded as the precursor of chemistry since it "was established on the principle of secret knowledge. It was the science of Gnosticism. Its technique was based on the idea that in the endless mixing of the same chemicals -- chemical opposites -- they would somehow transcend themselves after a hundred or a thousand repetitions" (RKM). It is argued that this is the scenario of modern emergent evolution according to which (among other things) life will emerge from non-life provided enough time is allowed.

In Teilhard de Chardin's version of this mystic view matter finally emerges into pure Spirit, Point Omega or the Cosmic Christ. The final outcome (as with the World Wide Church of God) is that we all evolve till we become God. For the alchemist the material results were of no consequence save as a pledge of the coming higher spiritual state of consciousness. In the mysticism now endemic in society S.J. Gould's "punctuated equilibrium" in evolutionary theory is a cheerful reminder that evolution towards the final state may proceed faster than we had been led to imagine. Well well! (*Creation, Social Science and Humanities Quarterly*, 1982, Spring vol.4 No 3; 1429 N. Holyoke (316) Wichita, Kansas 67208.)

An amusing reference item in the documentation to this well referenced paper tells us that L.S. Schumacher's *Truth about Teilhard* may now be ordered from Mary Immaculate Queen of the Universe Center, P.O. Box 1207, Coeur d'Alone, Idaho 68814, USA.

A BIGGER BANG?

Astronomical speculation gets more and more exciting! Piet Hut of Princeton with Martin Rees of Cambridge have been wondering whether, when the universe cooled after the Big Bang, the vacuum of space which was formed was, after all, at its minimum energy state. Or did it reach a metastable minimum "separated by a high enough barrier from the absolute minimum" to ensure a relative stability? Perhaps the slow transition from the 'false' to the 'true' vacuum is too slow to have occurred in the time and space available (i.e. "in one Hubble spacetime volume"). "In that case our vacuum state might suddenly disappear if a bubble of real vacuum formed which was large enough for a bulk energy gain. Such a bubble would expand at close to the speed of light with an enormous energy release..." All of which is quite consistent, we are told, with some of the modern field theories. One begins to wonder if Hut and Rees have been reading Heb 1:12, "As a mantle shall thou roll them up ... and they shall be changed").

Another problem is then raised. Is there not a terrible risk that the back room boys at Geneva who so enjoy watching high energy particles colliding with one another, will accidentally make the beginnings of the great bubble which will (or might) bring our universe to an end? The authors are optimistic: the energies available are not great enough (not yet any way). *Nature*, 302, 508. Comforting thought! We are reminded of the early fears lest the first atom bomb might trigger an explosion which would destroy the earth.

EARTHQUAKES: PREDICTION AND LIGHTS

The Chinese have been observing the abnormal behaviour of animals in the hope that these may give warnings of impending earthquakes. Success seems to have been fair since 1966 (Xingtai quake) but no prediction was made of the (force 11) disastrous quake at Tangshan in N. China on July 28 1976 when 90% of the buildings in the city fell and 242,000 people were killed and an equal number badly injured.

Because all reports of abnormal animal behaviour tend to be anecdotal they have been largely ignored by the Western world. What is it, we may wonder, which makes cats pick up their kittens and

leave their homes, or arouses snakes from hibernation in their burrows out of which they crawl into the open where they may freeze to death when the weather is cold? Helmut Tributsch, a physical chemist whose home village in N. Italy was destroyed in the 1976 Friuli quake questioned the survivors and learned of many curious happenings. Since then he has studied similar records of animal behaviour in connection with 77 other quakes and has written up his findings in his book *When the Snakes Awake* (MIT Press, 1982, £18). He believes that the answer probably lies in a change in the number of electrostatically charged particles in the atmosphere but numerous other possibilities seem open and the problem is by no means solved. Indeed, it might be said that no suggested explanation seems at all likely to produce these startling effects upon the animal world. Whether the effects are ultimately explicable in physical or scientific terms or not, Christians may rightly feel that the phenomenon has been incorporated into the scheme of things by God to give men and animals short term warnings of possible immediate danger ahead. (See review, *Nature*, 302, 763).

"After the wind an earthquake, but the Lord was not in the earthquake; and after the earthquake a fire, but the Lord was not in the fire ..." (1 Kings 19: 11-12). "...the Mount of Olives shall be split in two from east to west by a very great valley... and you shall flee as you fled from the earthquake in the days of Uzziah king of Judah... on that day ... there shall be continuous day (it is known to the Lord), not day and not night, for at evening time there shall be light" (Zech 14:4-6).

Thousands of reports of earthquake lights (EQLs) are now available "and a few drawings and even photographs have been obtained, but the origin of EQLs is still unknown." A "Project on Collection and Evaluation of Earthquake Light Phenomena" was initiated at Leeds in August 1982 and readers of *Nature* have more recently been requested to send reports to the Georgiana Observatory in Budapest (*Nature*, 1983 301, 368; see also p.377 on electromagnetic emissions). As in other cases the lack of explanation has led many in the past to deny that such lights are objectively real. (See this JOURNAL, 1940, 72, 160).

Since writing the above a paper (*Nature*, 302, 28-33) by D.A. Lockner *et al* of California has appeared: it suggests an interesting explanation. As a rule the light is seen only with quakes of magnitude 7 or greater and the light persists for a considerable time. (A photograph of an EQL at Matsushiru, Japan, in 1965 taken 16 seconds after the EQL commenced, is reproduced). Lockner *et al* point out that there is strange local frictional heating at a shear zone and that electric charge may be generated by the piezoelectric effect (especially if there is quartz in the rock), or by the movement or vaporization of ground water. The potential would be discharged at once in a conducting rock but the intense heat would vaporize the

pore water. Steam and water vapour are highly insulating and so is dry warm (as distinct from very hot) rock. The crack in the rock now lies between two sheets of insulating rock and as it develops further it becomes hotter and conducts once more. The final result is a thin sheet of hot electrically conducting rock between two insulating sheets and by the time the crack reaches ground level it has the shape of a wedge with its "cutting edge" at the surface. Electric charge concentrates at points and sharp corners so that the charge collects at the apex of the wedge, at which a corona discharge takes place into the air until the charge has drained away.

THE BIBLE AND SCIENTIFIC DISCOVERY

The Bible has influenced the course of scientific discovery in many strange ways, to some of which we have drawn attention in past issues of this JOURNAL (see, for example the section on M.F. Maury in our last issue, p.103).

Russel Stannard in his recently published *Science and the Renewal of Belief* (SCM Press, £2.95) suggests that the writing of the Danish theologian Søren Kierkegaard about truth and logic may have influenced Niels Bohr in his development of the idea of wave-particle dualism.

Another example seems to be afforded by the history of the discovery of penicillin. (*New Scientist*, 14 July 1983, 119). Alexander Fleming was reared in strongly Presbyterian Ayrshire. He had been deeply impressed, we read, by the strange words of Psalm 51:7, "Purge me with hyssop and I shall be clean". Returning from a holiday in 1929 he saw that a mold had begun to grow on a bacterial plate in his laboratory. He was surprised to see that the bacteria near the speck of mold were dead and he rightly concluded that the mold was producing a chemical which destroyed them. The mold was identified as *Penicillium notatum* and a literature search revealed that this had first been classified by the Swedish mycologist Westling who discovered it growing on a decayed hyssop plant. No wonder Fleming was anxious to isolate the chemical compound involved, though the difficulties at that time proved too formidable for success to be achieved.

SLAVERY

Slavery is never out of the news for long and the Anti-Slavery Society is still active. Recently, it has been trying to interest the United Nations in the plight of 100,000 slaves in Mauritania. The Republic has been independent for over 20 years, and is dominated by Islamic

Moors, the head of the State being the Grand Imam who says plainly that "Whoever does not support the principle of slavery is not a Moslem (and) is irreligious."

Much of what goes on in the country was recently filmed in secret by David Henshaw and Barry Bevins. Slave markets are held. "The stories were horrifying: slaves tortured and being dragged behind camels, thrown down wells, treated as beasts...A woman was said to have been strangled by her master because she fed her own child before his." On three occasions this century slavery has been officially abolished, but abolition does not go beyond the radio. (*Times*, 21 Mar 1983).

A few years ago publicity was given to slave raids by the Government of Paraguay who, with the aid of the army, were persistently raiding what was left of the peace loving tribe of Indians, the Arché of Paraguay. Most of the natives were murdered, the survivors being sold in markets. It was said that the Government Director of Indian affairs was himself a well-known trader in female slaves. (*New Scientist*, 16 Jan 1975, p.153).

In 1981 a journalist bought a girl for £130 in Morena, a town in Madhya Pradesh, and took her to Delhi to expose the "flesh trade" racket. The locals in Morena say they have lived with this for many years but do not dare expose it because anyone who says anything against the police, who condone the practice, is not seen again. (Report from Delhi, *Times*, 18 Aug 1981).

Though illegal, slave markets exist in Pakistan, female slaves fetching about £600-675. There are believed to be about a hundred vice dens which trade in them. The girls are abducted from Bengal, Bangladesh and Sri Lanka. (*Times*, 11 Feb 1982).

Although slave owning in England has been illegal since 1772, the law is proving very difficult to enforce in London where the staffs of foreign legations appear to be free to bring their slaves with them as if they were members of the families of the staffs of legations. The slaves work for long hours without wages and sometimes appear at magistrates courts for shop lifting. To disgrace a slave by punishing him or her under English law would make the person's conditions far worse: to return them to an Islamic country would often mean amputation of both hands. (See letter by Olive Pays Paynton in *Times*, 2 Aug 1983 and other correspondence). In some cases slaves in London are treated with great cruelty (Cf. Patrick Montgomery, Letter, *Times*, 30 July 1983).

The Bible clearly states that slaves will be bought and sold up to the time of the second coming of Christ (Rev. 18:11). A book on the history of slavery in the West appeared recently (A.C.De C.M. Saunders, *A Social History of Black Slaves and Freedmen in Portugal*,

1441-1555, CUP, 1982, 282pp., £27.50). Though there were slaves in the Iberian peninsula in the days of Moorish domination, the first slaves to be shipped there from West Africa arrived in Portugal in 1441. A brisk trade developed quickly. Saunders deals with the critics of slavery, most of them Spaniards. It seems that there was only one vigorous protest, which appeared in 1555, but it was completely ignored.

EARLY EARTH

It is a wonderful fact that, over thousands of millions of years, the temperature of the earth has changed very little indeed. Had it been otherwise, our earth could never have provided a haven for life in the universe, for either it would have become ice-bound (as did Mars) or over-heated (as did Venus) and recovery from either state appears to be impossible, at least beyond the very earliest stages. How has this remarkable thermostating effect been achieved, seeing that when the earth was young, the sun was a good deal cooler than it is today?

There are two possible explanations based on uniformitarian principles, and we may suppose that both have played an important part. First, there is radioactivity: radioactive isotopes of such elements as potassium and uranium were at one time more abundant than they are today and must have generated much heat. Secondly, it is possible, indeed likely, that carbon dioxide was more plentiful in the atmosphere than it is now and its greenhouse effect would have reduced the loss of heat which the earth received from the sun (see Henderson-Sellers *et al*, *Quart. J. Roy. Astron. Soc.*, 1980, 21, 74-81).

The second of these effects has recently been discussed further by J.C.G. Walker (*Nature*, 303, 518; "Possible Limits on the Composition of the Archaean Ocean").

Deposits of calcium carbonate are present in sedimentary rocks of all ages and there seems to be no marked deviations in the rate of their deposition. From this we may conclude that right back to the time when the ocean had first formed, it was saturated with calcium carbonate, just as it is today. But how was this so, if CO₂ in the atmosphere was so plentiful? Would not the CO₂ have kept the carbonate in solution? Walker meets this difficulty by suggesting that the ocean was at one time more acid than it now is - his calculations cover a possible pH range of 6 to 8.

Early evaporites contain much calcium sulphate and these continued to form in the Precambrian and the Phanerozoic, again with apparently little change in the rate of formation. The sea, then, must have been saturated with CaSO₄ from early times, as it still is today. The calcium ions were, no doubt, derived from the mantle, but what was the

source of sulphate? Volcanoes liberate hydrogen sulphide and sulphur dioxide, which seem to have been the only sources of sulphur. Hydrogen sulphide could never have become abundant in the atmosphere since the banded iron formations (BIF) of the Archaean age show that ferrous iron (together with ferric) was present in solution and ferrous sulphide (which is very insoluble) was not formed in quantity. Though pyrites could have been formed under these conditions, diagenesis and bacterial reduction of sulphate are more probable (Clemmey & Badham, *Geology*, 1982, 10, 141-6). The sulphur volatiles might have been oxidised to sulphate by free oxygen or perhaps by photochemical reactions, the oxygen being derived from water. Though Walker does not discuss the point, the evidence would seem to be incompatible with the highly reducing early atmosphere which abiogenic theories demand.

In another Letter to *Nature* (304, 54), E.M. Cameron discusses the partial separation of the isotopes of sulphur in the Precambrian oceans. The element sulphur contains the isotopes S-32 and S-34. Separation of the sulphurs takes place biologically when sulphate-reducing bacteria reduce sulphate to hydrogen sulphide. The sulphides to which this gives rise are depleted in S-34 to the extent of up to 3% and such sulphides, formed in the early oceans, date back to 2,300 million years (Myr). (We would note that this requires the existence of reducing bacteria and an oxidising atmosphere at an early stage of the earth's history, requirements which impose increased restrictions on the proposed evolutionary scenario!)

When calcium sulphate is precipitated from water, the ratio of the sulphurs is unchanged, but when a solution of calcium sulphate is evaporated, the solid evaporite is enriched in S-34; the oldest known evaporite (with a 1.75% enrichment) is dated at about 1,300 Myr. Earlier layers of sulphate (e.g. one of barium sulphate dated before 3,200 Myr) has no enrichment of S-34. As evaporites cannot form until there is land, the early earth must have been covered with ocean until some time after 3,200 Myr and before 1,300 Myr.

These papers confirm the earlier findings of geophysics, especially the view that in its early days the earth was entirely covered by ocean, as is indeed clearly stated in Genesis 1:6-7. (See this JOURNAL, 104, 81f).

REDC with Dr J.H.J. PEET

DAVID D. BRODEUR

THE NEGEV: ISRAEL'S UNDERESTIMATED HALF?

Dr Brodeur continues his studies of the State of Israel with this paper — of considerable biblical interest — on the Negev.

And the Desert Shall Blossom

Two years after President Anwar el-Sadat's historic journey to Jerusalem, U.S. Secretary of Agriculture Robert Berglund announced that Egypt, Israel and the United States had placed under consideration formation of a multi-billion dollar consortium to undertake a large-scale irrigation of the Sinai and Negev using Nile River water.¹ Berglund explained that the U.S. and Israel would provide much of the technical know-how, but that the financing would be shared by the three members with possible additional input by private industry and the World Bank. Carried away by enthusiasm, the secretary offered that "The region could be made to look like the San Joaquin Valley in California."

The immediate beneficiary of the bold scheme would be food-deficient Egypt. Berglund went on to quote Isaiah: "The wilderness and the solitary place shall be glad for them; and the desert shall rejoice, and blossom as the rose." (Isa. 35:1, AV). There is another passage in Isaiah that comes to mind with the Berglund scheme:

I will make the wilderness a pool
of water, and the dry land springs
of water. I will put in the wilder-
ness the cedar, the acacia, the myr-
tle, and the olive; I will set in
the desert the cypress, the plane
and the pine together.

(Isa. 41; 18-19)

The first time that Nile waters flowed through the Sinai was in 1917, via a modest, 2-inch waterpipe constructed by the British to support their war against the Ottoman Turks. The Negev portion of the Berglund scheme will probably have to wait until the completion of the relocation of the Sinai airforce bases into the

Negev. The resulting programme involved the dismantling of 103 army camps and installations, and building 37 substitute camps in Israel proper. And then there is the highly charged and controversial issue of conservation. Originally, the Israeli Society for Preservation of Nature called for setting aside 1.2 million acres, more than a third of the whole Negev, which includes part of the Judean Desert.² The Society's ambitious scheme was even endorsed by the government Antiquities Department, while the military stood impatiently by, anxious to grant contracts for hundreds of miles of road, runway and pipeline.

It is estimated that 1,200 varieties of plants grow in the Negev, 76 of which are unique to the region. By another calculation, about 10% of the plant types found in the whole Saharo-Arabian desert belt, stretching from Morocco to western India, are believed to be represented exclusively by the Negev.³ Added to that are over a 100 species of animals and birds.

In anticipation of the military's inroads upon the heritage of the Negev, the Antiquities Department sponsored 160 rescue digs aimed at salvaging some of the significant sites. The survey at Ramat Matreid, site of one of the three relocated military airfields, revealed a large concentration of archaeological sites dating from the early Canaanite period. In early 1981, the government's Nature Reserve Authority, the other environmental entity involved in the negotiations, reported that three large reserves comprising over one million acres, 35% of the Negev, had been set aside. In addition, it was offered that extensive army firing ranges, normally closed to the public, would also serve, on balance, for the enhancement of wildlife and its propagation.³

Our Landscape is not sufficiently cherished, our environmental instincts are undeveloped---the sober statement appearing at the very end of Abba Eban's long *Autobiography*^{4a} appeared to be on the verge of vindication. In the context of history and geopolitics it should not, however, be forgotten that the chief *raison d'être* for the Negev, and the considerable sacrifice of human and material resources that Israel made in 1948-1949 to secure it, was not for the purpose of collecting a second maritime outlet, but to keep apart two hostile neighbours: Egypt and Jordan.

Re-Creation in the Desert

The high importance Israel attaches to the sword-like sliver of the Negev has already been justified in the fields of mining and agriculture. The significance of its archaeological investigations will be touched upon presently. Of course, there is also pessimism in some quarters over the purely demographic potential of the

Negev which Ben Gurion chortled so optimistically about. Similar doubts were advanced throughout the 19th Century concerning the prospects of any meaningful Jewish settlement or enterprise in Palestine. Israel cannot afford to neglect the Negev, if for no other reason than that it comprises about one half the total area of the 1949 truce lines.

In the fall of 1968, I visited the Negev for the first time. Seeing Israel had been an afterthought of an Italian vacation, and I had little time to spare in the Holy Land. Yet, there was no question in my geographer's mind about what I should attempt to see first: the Negev. I had some noble company. During his momentous lifetime, Moses had twice spent long periods in isolation and austerity in the contemplative quiet that the greater Sinai offers. In 1980, the late, great peacemaker with Israel, Anwar Sadat, rediscovered and articulated the joint spiritual heritage of the Semitic peoples at the base of Mount Sinai.

I was not yet installed in my room in a third-class hotel behind the Tel Aviv waterfront when the ebullient manager, obviously reading my mind, began to talk of the Negev.

The next morning, at six a.m., I boarded a sleek, airconditioned tour bus. The motley bunch of us headed south-east, first through the highrise suburbs of Tel Aviv, where clusters of houses look as homely as any in the world, though they are devoid of any landscaping, the soil about them drifting into the streets. Then, the drab hallmarks of civilization gave away to the pleasant orange and green of the famous Jaffa groves. Beyond the groves, we encountered some high dunes. With ear-splitting shriek, a brace of Israeli Phantom jets swooped down upon the dunes, probably in a mock bombing run. Then, blessed with a silence overridden only by the drone of the diesel motor, we moved into a gravelly landscape with sparse vegetation. This, not the sand dunes, is the character of most of the deserts of the world. We were steadily encroaching upon the Negev, which in Hebrew simply means *the south*. Here and there, irrigated farms popped up like squares on a checkerboard, an encouraging contrast to the creeping desertification that much of the globe is now experiencing from central Australia to East and Central Africa.

By mid-morning, the big bus was snaking its way through the dusty streets of Bedouin Beersheva. The desert centre's adobe appearance belies the fact that around it are situated research laboratories, factories, even a university. However, the Bedouins took an instant dislike to the Art Deco bazaar that the Israelis had constructed, without their consultation, for the rationalisation of their activities.

Beersheva has had a romantic history. Hagar, Abraham's cast-off Egyptian wife, took her son Ishmael into the wilderness around Beersheva. God promised to make Ishmael's offspring (by tradition, the Bedouins and Arabs) into a great nation just like the Jews. Meanwhile, Abraham dug a well for his flocks at Beersheva, where he was often preoccupied with squabbles with Abimelech, a local chieftain rival, with whom he ultimately made peace. As a result, the place became known as *The Well of the Oath* (Gen. 21:31-32) which is the etymology of the present day name. And, ironically, the systematic removal of the nomadic Bedouins from the northern Negev, in progress since the 1970's by Israel, is calling into question Israel's independence pledge that the desert people had a venerable claim to the region.

In a memoir, David Ben Gurion relates that before the fighting of 1948 was over he met with officials of his government to discuss settlement of the first 300 Jews at Beersheva, there being not a single Jew resident there at that time.⁵ A century ago, it was only a Bedouin encampment, a cluster of eight wells, most of them filled with rubble.

The Negev is critical to the existence of Israel, it comprises not less than five-eighths of the status quo land of 1949. At that time, the soon-to-be martyred UN mediator, Count Folke Bernadotte, advanced a plan that included Israel exchanging with the Arabs the Negev for the better-watered Galilee, much of which Israel had won by war gains. By contrast, the UN Partition Plan had awarded all of the Negev to a Jewish state, except for a finger part way along the 1906 boundary with Sinai. While the UN designated that the finger should go to Egypt, Israel's independence forces had other ideas. Taking advantage of a newly discovered fragment of an old Roman road, they pushed their frail, scant armour in behind an Egyptian army and secured the remainder of the old, straight, 1906 survey line boundary before the last cease-fire took effect.

After the War of Independence, Zionist settlement plans for the Negev were under constant review. It was hoped that the rugged wastelands that attracted first Ben Gurion (now Ariel Sharon), would lure up to 100,000 Jewish settlers. Even Chaim Weizmann was enamoured of the region, proclaiming "magnificent redemption in the southland".⁶ Ambassador James G. McDonald notified President Truman that the Zionists would never give up the Negev until "the last Jew had died in its defense."^{4b}

When Abba Eban, a Jewish Agency observer to the United Nations Higher Committee on Palestine deliberations in Geneva, reported UNHCOF's vote for partition to Ben Gurion, the incredulous Prime Minister replied "What was that you said? A Jewish state including the Negev?"^{4b}

There were probably few people more articulate about the hidden treasures of the Negev than our portly tour bus guide who claimed to speak seven languages: "About average for an Israeli", he modestly admitted.

A few miles south of Beersheva, we came upon a tiny, cross-roads settlement. Only two houses were visible, each dwarfed by its steel mesh radio mast. The guide automatically rose from his jump seat beside the driver, grabbed the mike and intoned, "In that green house over there sits our Churchill writing his memoirs."

"And who might that be?" asked an elderly little English lady in her high pitched voice. "Ben Gurion", was the two syllable reply.

Born David Grun, in Poland, as a young man Israel's first prime minister adopted the name of a leader of the tragic uprising of 66 A.D. The name means 'son of a lion cub'. Hoping to get a glimpse of the familiar old white mane, many passengers craned their necks toward the glass. Nothing! The lion was quiet that day.

For the next several dozen miles, as we entered upon the true Negev, not a single soul or vehicle came into view. This was the ancient Wilderness of Zin, aptly described in the fifth Book of Moses as the place "...whose stones are iron and out of whose hills you can dig copper" (Deut. 8:9), a grim wasteland whose northeastern reaches, around the southwestern extremities of the Dead Sea, merge into the biblical 'Wilderness of Zin'.

Geologically and topographically, the Negev is a highly dissected plateau that tips up somewhat toward the southeast, due to later uplift. While the plateau of the Negev terminates abruptly on its Jordanian side, in the Great Rift Valley that runs from central Lebanon to central Africa, on the west it merges quite imperceptibly into the Sinai.

The Sinai boundary, in fact, has a piquant history. Consisting of a straight survey line, with three little jogs, the southernmost of which reflects an attempt to correct erratic surveying, it was accepted in 1906 by the Turkish masters of Syria-Palestine and the Sinai only after the English took up positions in the desert. The old boundary allowed the Turks to control about four-fifths of the Sinai, giving the Ottomans access to the east bank of the Suez Canal lifeline to India. Upon their occupation of Egypt in 1882, the English began to scheme on ways and means of securing *both* flanks of the Suez. The ill-fated Zionist settlement scheme at Gaza, considered by Herzl, was one issuance of the overworked British strategy.

The present boundary, recognized by Egypt, runs, as it has since 1906, from a point just west of Rafah in Mediterranean Israel to the Gulf of Akaba. It was based mostly on drainage divides determining which streams or wadis flow into the Sinai and the Aravah, or lower Jordan Valley, the above-cited Rift. Through an accumulation of survey errors in 1906, more land at the head of the Gulf of Akaba remained under Turkish control than had actually been agreed by the two powers.

By and large, the Sinai boundary had withstood remarkably well a whole succession of sovereignties over Palestine. First, it was adopted by the League of Nations to set out the western limits of the Palestinian mandate (1922) recommended by the Treaty of San Remo (1920). Next, the recommendations of the United Nations Special Commission on Palestine (UNSCOP) endorsed the 1906 line, recommendations that led to the historic UN Resolution of November 29, 1947. A deviation from those proposals resulted in 1949 when the negotiations of the Israeli-Egyptian armistice awarded a narrow coastal strip situated between Rafah and Gaza to Egypt. This gave birth to the notorious and controversial Gaza Strip, the spear-like enclave of Palestinian refugees which militant Israelis liken to a dagger thrust into the side of the Zionist state.

Hopefully, the boundary will stand the test of time now that Israel has completed (April 15, 1982) the final phase of its multi-stage withdrawal from the Sinai in accord with the provisions of the peace treaty of March, 1979.⁷

As one who has been studying and writing about the Arab/Israeli conflict for fifteen years, I am convinced that Israel has no intention of allowing a Palestinian state, or fragment thereof, form on the Gaza Strip. The prospects of the coastal enclave being voluntarily returned to Egyptian trustee-ship remain dim. And what about its status in ancient times? While there is little doubt that David and Solomon included the Gaza Strip in their conquests, recent archaeological discoveries apparently point to a more ancient Egyptian hegemony. Between 1972 and 1980, Israeli excavations at Delt el Batah, an Arab village in the Strip, has revealed the presence of tombs attributed as the final resting places of high pharaonic officials, and also an Egyptian residence dating from the time of Rameses II, the traditional pharaoh of the Exodus.⁸ The discoveries have given rise to speculation not only that the area was then controlled by Egypt, but that the garrison's presence astride the favoured coastal caravan route to Canaan probably influenced Moses to opt for a return via the southern Sinai.

A Lunar Landscape

Such facts were unknown, of course, when I was lurching around the bends and dips of the Negev in that big Egged bus a dozen or so years before. The moonscape repetition of wadis and rises was sufficient to make me long for a good stretch of Roman desert highway, or modern bitumen. Now, with the Negev being rapidly transformed into a network of military bases, airfields and depots, the gravel highway will become a thing of the past. The improved roads will no doubt link up also the most impressive of the Nabataean-Byzantine ruins of the Negev: Isbeita, a complex situated about thirty miles from Sede Boker.⁹ However, the site was not attainable during the gravel road days of Israel's first quarter century in the new Negev. Instead, the Tel Aviv-Eilat one-day excursions programmed their luncheon stop at the sister site of Avedat, ancient *Eboda*, a Grecian-like oracular little plateau on which stands, all crowded together, the ruins of a 5th century Byzantine church and monastery, the only remains of the city of Eboda. The church was constructed with stones mined from an abandoned fortress of the Tenth Legion, the Roman force that helped to subdue Jerusalem and Masada during the great uprising of 66-73 A.D.

A century or so after its construction, a severe earthquake destroyed many of the Nabataean-Byzantine centres, and their irrigation works. Eboda perished. And it may have also been the death knell of the flourishing desert culture.

I wandered back and forth among the stones in that chilly September air, wondering if the same earthquake — or perhaps a later one — had also altered the flow of the groundwater so that springs referred to in the ancient Book of Judges of the Old Testament ceased to flow forever (Judg. 1:15). The mysterious Nabataeans built up quite a civilization during the centuries just before and after Christ. How they managed to survive, much less prosper, on from one or two inches of rainfall each year was brilliantly reconstructed by American archaeologist Nelson Glueck, and described in his book *Rivers in the Desert*.¹⁰ Nabatean engineers created a latticework of ditches and cisterns which trapped almost every drop of usable moisture. Even the dew was captured. These desert traders also trapped the rain that fell upon the roof tops and funnelled it into household cisterns; the surplus then was channelled into the communal water supply.

Israeli technicians have reconstructed some of the old Nabataean networks with a new twist: concrete liners to reduce seepage. Quality almonds, apricots and other nuts and fruits are being grown on nothing more than the desert runoff, precisely metered amounts of it seeping from perforated plastic pipe tapping a V-shaped catchment

area that is adequate for just a single tree. The drip irrigation method also has the advantage of leaching harmful salts out of the root systems.

While the northern Negev and its urban triangle, Beersheva, Arad and Dimona, currently depend upon the National Water Carrier, which taps sources of the Jordan, realization of any large-scale settlement programme further south ultimately depends upon discovery of a more economical way to desalinize seawater than the method currently being employed to sustain Eilat. A second generation plant is in the offing for Ashdod, the new city due west of Jerusalem, near the coast, built in the 1960's. It is expected to desalinize 10 million gallons of seawater per day.¹¹

Minerals in the Desert

The Negev's great inland lake is the Dead Sea whose northern reaches extend, of course, well beyond the true Negev. Since 1934, or earlier, Jewish enterprise has managed the huge potash industry near Sodom, where the sun's heat is used to evaporate Dead Sea water, potassium carbonate, potassium chloride, magnesium bromide and chloride, and common table salt¹² being the products. During the second world war, potash plants operating at both ends of the Dead Sea supplied much of the United Kingdom's potash requirements.¹³

More recently, Israeli scientists have discovered a method for extracting more of the potash content from brine, an advance that has significance for the fertilizer-barren Third World. The Dead Sea now supplies Israel's magnesium requirements. In addition to this vital material, lithium salts are obtained.

Another development is the discovery of the sea alga *Dunaliella bardawil* which grows rapidly on shallow ponds of very salt water. Up to 40% of its dry weight is glycerol, which is now exported: the residue provides a rich protein suitable for animal feed and beta-carotene used in the food industry.¹⁴ From the ground, the Negev yields superphosphate material essential to the production of the three most commonly used fertilizers.^{15a} Major methane gas deposits were discovered near Sodom, site of the Dead Sea Works, in the 1960's. And to the west, in the hills around Arad, there is ball clay, for brick making, and plaster of Paris. Small deposits of manganese and molybdenum, essential steel hardeners for industrial nations, and also iridium, cobalt, and caesium have been found in the Negev.

With such mineral abundance, Ben Gurion envisaged the Negev becoming a major industrial centre. Instead, it is becoming a major military centre with the inevitable related industries. Another of Ben Gurion's wishful projections was for a maritime canal that would link the Mediterranean and the Gulf of Aqaba, via the flat rift valley of the Arabah, the continuation of the Dead Sea trench that is also filled by the Gulf. He probably did not originate this scheme, but it has now been superseded, in any event, by the shorter Mediterranean-Dead Sea Canal Scheme.

In an interview granted during his 80th year, Ben Gurion demonstrated his long view of history. He cited, as Israel's most important priority for peace, the settlement of the Negev. His reasons were several. First, it constitutes about half of Israel's Independence land. Second, it separates Egypt (Sinai) from Jordan and Arabia. A concentration of Jewish population in this wilderness wedge would make any linkup of forces by these Arab countries more difficult. The third reason is partly historical. Ben Gurion cited the fate of ancient, coastal Carthage which fell to a broader based and better organized Rome. With reference to the dangerous over-concentration of Israel's urban population in the coastal Tel Aviv area, he observed: "If the state does not put an end to the desert, the desert is likely to put an end to the state."^{15b} As examples, Ben Gurion could have cited *Leptis Magnis* in North Africa, and *Gerasa* in Jordan — both great, ancient urban centres swallowed up by the phenomenon of desertification that is once again ravaging the world.

For Ben Gurion, the Dead Sea was not an anachronism, but a wonderful inland sea; what the Great Lakes are to the United States. No wonder! That slimy water body boasts an estimated 42 billion tons of chemicals.^{15c} One of the more quaint speculations about the Salton Sea, with more than faint overtones of biblical prophecy, is that one day Israel will solve all its economic and financial problems, and become fabulously wealthy in the process, by filtering the gold reputed to be in suspension in even larger quantities than the densest known 'pockets' or 'lenses' of gold that German electrochemist Fritz Haber proved were in the seven seas, when he roamed them in the 1920's, anxious to find a way to pay off Germany's staggering reparations debt by a single, staggering coup! To date, chemical analyses of Dead Sea Water, at least the ones the Israelis are willing to talk about, do not reward speculations about a liquid el Dorado. According to one analysis, neither gold nor platinum could be found in detectable quantities.¹⁶

A Sea to Sea Waterway

In March, 1981 the Begin government approved a scheme to construct a 50 mile long channel for the transport of Mediterranean waters to the Dead Sea, a natural fall gradient of about 1,300 feet.¹⁷ The project could realize between 100 and 150 megawatts of electricity for the national grid. The canal could also interlock with a successful pilot scheme on the Dead Sea---production of electricity from the harnessing of the natural heat stratification of Dead Sea brine.¹⁸ The goal, of course, is to free Israel from the curse of imported oil. However, solution of a serious economic problem may raise the spectre of an equally serious international legal problem. The question posed is the legitimacy of Israel's plan to tunnel under the four-mile wide Gaza Strip, which is Egyptian territory. Israel unsuccessfully tried to conquer the strip during the War of Independence, but has kept it under constant occupation since winning it as the spoils of war in 1967.

Because of its nearness to the Tel Aviv mini-conurbation, Israel is very reluctant to return the Gaza Strip to Egypt. Moreover, Israel claims that the Gaza Strip-Judean Hills route is the most economical of all routes for the Dead Sea Canal. In any event, conveying the Mediterranean under the strip would undoubtedly provide Israel with another argument for not restoring the Gaza to Egyptian sovereignty.

Live Wire from the Dead Sea

For nearly a half century direct sunlight has been employed to evaporate Dead Sea brine for the chemicals used in artificial fertilizers. A few years ago, Israel undertook an important new step in the exploitation of this benign-looking natural resource. On the northern shore of the sea they constructed a resort hotel that is both heated and cooled by mechanisms that take advantage of the varying ambient temperature of the natural stratification of the brine. The sea is first diverted to shallow, constructed pans whose blackened bottoms produce temperatures of 91-93°C. Then, the sun-heated brine is diverted to heat a low boiling working fluid. The vapour resulting drives a turbine which, in turn, generates electricity. In 1981, the 150 kW experimental generator was expanded into a 5,000 kW power station, the first in a projected string of power modules that could yield 2,000 megawatts. By the 1990's Dead Sea solar ponds, created by pinching of the Halashon Narrows, might supply a substantial part of Israel's electrical power requirements, freeing the country from its dependence upon foreign oil. And the feat could probably be accomplished a lot

cheaper than by the ambitious Mediterranean-Dead Sea Canal Scheme, whose natural fall could be tapped for hydro-electric power.¹⁹

About 98% of Israel's energy in the 1970's came from petroleum. More than a third of the oil, most of it imported, was burnt to produce electricity — one of the least economic uses for oil. As in the United States, frantic efforts have been under way in Israel to convert oil-fired power plants to coal. The first such unit, at Hadera, came on stream at the end of last year. While there is believed to be very little crude oil underlying Israel (the Sinai fields have already been returned to Egypt), there are large shale oil deposits in several places, including Dimona in the Negev and in the Hartuv Hills near Jerusalem. Just as the Burning Bush spoke to Moses, the burning rocks are sending a signal to latter day Israel. Two years ago, Israel signed an agreement with West Germany for an initial feasibility study for the exploitation of shale oil.²⁰ When all the dust settles on the relocated Sinai airbases, priority may be given to the undisturbed black dust which locks up millions of barrels of liquid fuel.

A nation in which servicing the interest in the foreign debt exceeds \$2 billion is praying, as prayed the Psalmist of old: "Restore our fortunes, O Lord, like the watercourses in the Negev" (RSV, 126:4).

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THE THEOLOGY OF CHARLES EARLE RAVEN: A 'SCIENTIFICALLY ACCEPTABLE THEOLOGY'?

Charles Earle Raven (1885-1964) was an outstanding liberal theologian and in the eyes of an American Episcopalian, James A. Carpenter, "one of the few really great theologians Anglicanism has produced"¹. Raven was also a distinguished historian of science and a naturalist as well as a passionate advocate of pacificism². He devoted much of his life to the reconciliation of science and the Christian faith and significantly when it was desired to publish a book on science and the Christian faith in the World Christian Books series, it was to Raven that the editor and publishers turned³. In addition to this book, which was published under the title *Christianity and Science* (1955), his most impressive books on this topic were *Science, Religion and the Future* (1943), which was reprinted as recently as 1968, and his Gifford Lectures *Natural Religion and Christian Theology* (1953), which represent the crown of his work, delivered and published after his retirement from the Regius Professorship of Divinity in Cambridge.

Raven, who held the Regius Professorship from 1932 until 1950, wrote an account of his religious experience in his book *A Wanderer's Way*, which was published in 1928. His life has been described in a lengthy memoir by Ian Ramsey⁴ and a full-length biography by F.W. Dillistone⁵.

1. Development of Raven's Religious Thought

We are fortunate that we can trace many of the factors that influenced Raven's religious and theological development. He tells us that his father seldom went to church and "it seemed he didn't need it"^{6a}. His mother, on the other hand, had a quiet and deep faith, and when she was not ill, went to church and her son went with her. However, the curate at a children's service warned him of the pains of hell and it ensured that in his mind the wrath of God eclipsed his love^{6b}. This no doubt explains why subsequently Raven was unable to come to terms with the Biblical teaching on the wrath of God.

At the age of thirteen Raven went to Uppingham School and he was confirmed at sixteen. He wrote that "the actual service thrilled me to the core"^{6c}. However, in his view he finished his

schooling "without any real understanding of Christianity either in theory or in practice"^{6d}. He went up to Cambridge in 1904 and three years later gained a first class honours in the Classical Tripos. During his first eighteen months at Cambridge he was, in his own words, "a pure pagan"^{6c}, but he used to attend the College Chapel with his best friend, Samuel Henry Hare⁷ who during "his student days won his way to an intense and vital faith in Christ"⁸. However, in August 1905 when Raven was alone in the Lake District on the summit of Great Gable, he experienced for the first time a moment of ecstasy⁹. This was followed in the Christmas vacation of 1905/6 by an experience which transformed his life not only bringing moments of rapture but somehow lifting his whole life onto a new level. "Suddenly", he wrote^{6e}, "the whole world seemed to be transfigured" and "the next two terms were spent in a haze of happiness". He had "the sense that for a moment time had stopped, that suddenly the visible world had become transparent, that the eternal reality, beyond and behind the things of sense, had been unveiled and in an instant of rapture had unfolded him into union with itself"^{6g}. From that moment onwards Raven realised that religion simply could not be brushed aside and this may have contributed to his decision in the following year to transfer from the Classical Tripos to the Theological Tripos. However, the study of Christian doctrine with Prof. Bethune-Baker did not make it easy for Raven to accept traditional Christian claims.

When Bethune-Baker became Lady Margaret's Professor of Divinity in 1911 he established a course entitled 'Lectures introductory to the modern study of Theology' of which H.E. Wynn¹⁰ has written "it would not be wholly a parody to describe[it] as an introduction to all the skeletons in the theological cupboard. As guardian of the studies of candidates for the Christian ministry, he saw it as his inescapable duty to prevent them passing through Cambridge with comfortable ecclesiastical assumptions uninvestigated ... He was convinced that cost what it might, men of religion must face the facts that are not easily reconciled with their accepted system of belief".¹⁰ Bethune-Baker felt that the concept of miracles in the usually accepted sense of 'violations of nature' did not do justice to the Judaeo-Christian concept of the divine consistency¹¹. It is, therefore, not surprising to find Raven writing in 1923; "The new physical sciences have rendered untenable the traditional ideas of authority, of the supernatural, of miracles, and in fact of the whole method of God's operation"¹².

One other member of the Divinity Faculty who exercised a great influence on Raven, as Dillistone^{5a} has pointed out, was H.M. Gwatkin, who had been Dixie Professor of Ecclesiastical History since 1891. He had been a strong candidate for election as the first holder of the Chair in 1884 but he had been passed over in favour of Mandel Creighton, in part because he was "vaguely credited with liberalism

in his theological views"¹³. His obituary notice in *The Times* said "he was well read in German theology and did not eschew its best influences". Theologian, mathematician and entomologist, Gwatkin was a man after Raven's own heart. "His learning, enthusiasm and generosity", Raven later wrote in his preface to *Apollinarianism*, "were an inspiration and remain an ever honoured memory to generations of students". Gwatkin rejected the "distinction that Aquinas drew between a kingdom of nature and a kingdom of grace governed by different laws"¹⁴ and Raven followed him in rejecting the distinction between nature and supernature.

The person, however, who was to exercise the greatest influence on Raven was Mr. J.H.A. Hart, who was a Fellow of St. John's College from 1902 to 1919. He was not ordained until 1929 and in subsequent years was to embarrass rural clergy and at least one archbishop by his partiality for conversing in Greek and Hebrew¹⁵. Raven studied the New Testament with him and he subsequently described him as "a theologian of brilliant originality and one of the most generous friends I have ever known". Raven characterised Hart's faith as being "heterodox in some respects... Here was a faith utterly free from cant or convention, a passion for truth which would accept no formula as final". "Intellectually", said Raven, "there is no one to whom I owe more"^{6h}.

If Raven's studies in divinity made the acceptance of orthodox Christian doctrine difficult, so did the studies he undertook in genetics. Largely as a result of the controversies over Darwinism in the previous century, by the time Raven went to Cambridge there was a complete breach between scientists and theologians. Christian thinkers had adopted a naive dualism in which the physical and biological world was assigned to science and that of 'mind' and 'spirit' to religion¹⁶. In a lecture in 1954 Raven described the situation thus:

No one who was at Cambridge in my day at the beginning of the century, certainly no one who did the crazy thing I did and undertook to study Christian theology and also genetics in the same post-graduate year, finding himself in the position of a circus-rider trying to ride two horses and ignoring the fact that they were going at top speed in different directions, no one who went through that experience would doubt that at Cambridge in that day it was very nearly impossible for an honest and intelligent youngster to be a scientist and a believer. That is not an exaggeration. The scientific concept of the universe in the year 1904 insisted that man, by the exercise of a purely quantitative technique in the categories of physics and chemistry and the procedure of the laboratory, could arrive at a complete and objective and accurate picture of the

universe itself; and that given a few more years of non-interference from these superstitious believers, it would be possible to complete an analysis of the whole physical universe; and that having analysed it, it would then be possible not only to grasp this sorry state of things entire, but reshape it to the heart's desire. We as scientists were sent out into the world believing that on the analogy of a great machine we could not only interpret the physical universe but look forward very speedily to being able to interpret life and our own human species, since we, like Descartes' animals, were mere automata, robots, interpretable in terms of the physics and chemistry of our structure¹⁷.

Prof. Bateson under whom Raven studied genetics "saw himself possessed of a religion that should free men of religion"^{18a}. His general position can be judged from the concluding words of his inaugural lecture as Professor of Biology at Cambridge:

Ladies and gentlemen, it is certain that two blue-eyed parents cannot produce a brown-eyed child; and it will soon be certain (we already have abundant evidence) that two kleptomaniac parents cannot produce an honest child. What then will happen to your laws of Moses; what will happen to your legal and juridical process? You would not think it fair to sentence a man of my shape if having received that shape from my ancestors I cannot run a hundred yards in ten seconds¹⁹.

The deterministic theory of heredity so vigorously championed by Bateson represented a challenge to Raven's developing religious faith. In the years to come Raven made it his aim to reconcile his scientific convictions and his religious experiences.

Raven left Cambridge in 1908 and spent a year as Assistant Secretary for Secondary Education under the Liverpool City Council. This year was to be the most crucial period of his life. He had not resolved in his own mind the relationship between heredity and determinism. Natural history had been his hobby since childhood and as an undergraduate he had spent most of his vacations in the pursuit of moths⁶¹. While he was at Liverpool he continued his studies on Lepidoptera and this brought him into contact with a tobacconist, Mr. F.N. Pierce who was a noted authority on Lepidoptera. He also ran an immense boys' club and organized an undenominational children's service on Sunday evenings^{5b, 6j}. Here Raven sensed the presence of God: "God came far nearer than he had ever done in a cathedral"^{6j}. Save once for a bet at Cambridge Union Society, he had never spoken in public but it was in Liverpool that

he gave his first lecture, significantly on the subject of evolution, and in the hall of a Congregational Church he gave his first religious address^{6j}. However, the decisive event in his religious development occurred when on a bank holiday he went to visit his friend S.H. Hare, who was now a curate at Stoke-on-Trent. Hare was ill and as Raven wandered up to his friend's room thinking of their love for the countryside and music and all beautiful things, the place seemed unutterably dismal. He entered his friend's room:

I found him and behold he was not alone. No other phrase will express it^{6j}... Since I had seen him, he had found Jesus, and the effect of the discovery was manifest. His whole direction and outlook were altered under the new influence: there was a joy and quiet confidence in his face, purpose in his life, sympathy and strength in all his actions. Jesus was alive and present to my friend as he had been to the eleven in the upper room. He was alive and present to me.^{6k}

Raven was self-critical of the experience but it could not be gainsaid:

There was nothing strained or fantastic, abnormal or supernatural about it. Quite literally it was as simple and obvious as if my friend had with him a revered and sympathetic colleague who listened to our talk and influenced our every moment by the atmosphere of his presence^{6l}.

From that moment onwards Raven never had any doubts about the reality of Jesus. So when in 1909 he was offered the office of Dean of Emmanuel College, Cambridge, he accepted and that acceptance involved a decision to take Holy Orders. In Raven's conversion experience there was an overwhelming sense of the presence of Jesus and it was to be his concept of Jesus which was to dominate his theology.

During 1917-8 Raven was a chaplain to the Forces in France and this experience was to leave a profound impression on him and may account in part for his antipathy to German theology. He became aware of the presence of Jesus in a new way: "He was never absent and I never alone, and never save for an instant or two broken by fear"^{6m}.

Raven later said that "man's religious experience is essentially indescribable, a moment of ecstasy and abasement for which neither words nor symbols are adequate"²⁰. In Raven's eyes mysticism was the fundamental element of religion and he quoted with approval Whitehead's dictum 'religion is the vision of something which stands beyond, behind and within the passing flux of immediate things'²¹.

Mystical experiences cannot be forced or anticipated: 'suddenly we know not when or why, the presence breaks in upon us'²¹. Raven opposed Barth's theology because he felt that it neglected "the conviction of humanity that in its moments of supreme experience, there is real worship, real guidance"²². However, it was supremely his experiences in France which, in his view, made Barthian theology untenable:

If Dr. Barth had been himself in the trenches instead of ministering to a congregation in Switzerland, I do not believe that his theology would have taken its present form. If he had known, the direct effects of gas and bombardment, if he had experienced the loneliness, the horror, the cowardice, the self-abasement and won through to the conversion, the faith and joy which followed it, he would recognise that his theology for all its power and sincerity is as one-sided as his exegesis of St. Paul²³.

While Raven was not alone in considering that Barth's theology was essentially a 'theology of the study' and not of the real world, he never seems to have asked why Sir Edwyn Hoskyns, who had also served as a military chaplain in France, did not find that his experience of war made Barth's theology untenable. In fact, after the war Hoskyns moved away from his early Catholic modernism, mainly as a result of reading the second edition of Barth's commentary on the Epistle to the Romans²⁴.

Thus, Raven's somewhat arid studies in divinity, his mystical experiences, his studies in genetics and his service as a military chaplain all contributed to making him one of the outstanding liberal theologians of the day.

Along with other liberal theologians Raven believed that the scientific method had reshaped man's understanding of the universe and so the fundamental task of the church was to re-interpret her doctrines in the light of this new situation^{18b}. So he conceived that the aim of theologians was to develop a "scientifically acceptable theology"^{23a} which began not with the "dogmas about God, but with the facts of religious experience"²⁶.

Raven's approach to theology, however, was not without its critics and from 1931 onwards he was aware of the growing influence of Karl Barth in British theological circles. In 1943 Raven, adopting the epistolary style of C.S. Lewis's *Screwtape Letters*, delivered a scathing and bitter attack on continental theology in his book *Good News of God*. To this book Franz Hildebrandt wrote a well-argued reply in a book entitled *This is the Message*. Hildebrandt put his finger on the essential difference between Raven and himself when he wrote:

The one needful thing I find missing in the *Good News of God* (is) the fact that the Good News is his revelation not our conception, his own word coming down from heaven, carried by his messengers, the prophets and apostles and embodied in the scriptures of the Old and New Testaments²⁷.

The same point was made by Daniel Jenkins when he said in criticism of Raven and the other liberal theologians that the neo-orthodox theologians had "a different conception of the nature of theological truth from theirs. As we understand them, they are not concerned as we are to assert the absolute once-for-all character of the Gospel revelation, and its necessity of marking off its truth from that of the world"²⁸. Raven, in fact, believed in progressive revelation and, citing John 16:13, "When the Spirit of truth comes, he will guide you into all truth", he said "Christendom ... by its Scriptures was committed to a belief in ... revelation still incomplete"^{29a}. Writing in 1928 he had written "It is not surprising that whereas a century ago men described religion in terms of revelation and the gift of God, nowadays they treat it from the standpoint of human experience"²⁹. There was thus a fundamental difference between Raven on the one hand and Barth and Hildebrandt on the other concerning the nature of revelation and this constitutes, in my view, the fundamental reason why Raven rejected the theology of Barth.

2. Principal Ideas in Raven's Theology

2.1 Christology

Just as Raven's religious experience was dominated by an experience of Jesus Christ, so his theology was Christocentric. It is not without significance that his first theological publication was a series of lectures on the Incarnation and its interpretation in the light of modern thought, which were published under the title *What think ye of Christ?* (1916), while his first major work was *Apollinarianism* (1923), which had the sub-title 'An Essay in the Christology of the Early Church'. Like every present day theologian Raven had to consider whether in the light of New Testament criticism it is possible to build a Christology on the Gospels. Raven's own studies convinced him that it was possible to know sufficient of the historical Jesus from the Gospels to build a doctrine of the person of Christ^{30a}. Raven valued the Fourth Gospel highly holding that its author was an old man who looked back upon Jesus whom he had loved in days long past but vividly remembered^{30b}. In *What think ye of Christ?* Raven expressed his conviction that "on grounds of both historical and literary criticism we can accept the traditional account of the Fourth Gospel and use it along with St. Mark

and Q for the study of the life of Jesus"^{30c}. Fifteen years later he wrote that the Fourth Gospel "looks like a work of memory, enhanced and on occasion distorted by years of reflection and religious conviction. Its author ... may well be John of Zebedee described in the other Gospels. His work is an artist's impression of the unique personality, whom he has known, served and loved"^{22b}. Raven thought that the Fourth Gospel was written about A.D. 70 but published at or after its author's death, in Trajan's time or about A.D. 95^{22c}.

Throughout Raven's writings there occurs the problem of the relationship of the Deity to the humanity of Jesus. "While Raven's contemporaries were wrestling with the problem of this doctrine, whether with the aid of 'kenosis' or by other means", wrote A.M. Ramsey³¹, Raven answered the question without fuss or travail by something near to the identification of the divine and human". The difference between Jesus and other men Raven considered to be essentially one "of degree rather than of kind": Jesus "transcends us as the perfect does the partial, as the image of God does those who are spoiled copies of that image"^{30d}. At first Raven was hesitant to speak about the pre-existence of Jesus, preferring to base his faith on the Gospels rather than the credal statements of the Church^{30e}, but later he was happy to affirm that "the Fourth Evangelist's emphasis upon his pre-existence, his Sonship, his incarnation as the eternal Word is right", although Raven added "this does not remove him from our species"^{22d}.

Raven was aware that in asserting that the difference between Jesus and other men was essentially one "of degree rather than of kind", he was almost certainly guilty of a technical heresy. To this he replied that in the early period of the Church's history Christians in fact accepted that the difference between Jesus and other men was one of "degree" and that Athanasius in his *De Incarnatione* "does not hesitate to urge pagans to accept the divinity of Jesus on the ground that they already accepted the divine inspiration of other men"^{30f}. The view that this difference is one of "kind" means "if pressed to its logical conclusion ... a denial of the Incarnation, since a Christ who differs from us in kind is ... simply not a man at all"^{30g}. Acceptance that this difference is one of degree does not mean that "all men are potential Christs" nor "does it mean that we can or ever could be his equals"^{30g}. "His relation to us will be that of a 'perfect round' to the 'broken arcs', of the white light to the myriad hues of the spectrum ... In Jesus will be the fullness of that Logos of which we by virtue of our humanity possess what Justin Martyr called 'seeds'. The perfect Man is for us men the Incarnate Son of God: he could not be so unless we were in our measure also sons — prodigal sons — of the same Father"^{29a}

It was Raven's Christology which provided him with the key to the understanding of the relation of God to the universe. As we shall see later (Section 2.3) he made use of the concept of emergent evolution and he criticized L.S. Thornton, who also employed this concept in his book *The Incarnate Lord*, for his failure to admit "the divine humanity of Jesus"^{22e}.

Raven's Christology has not been without its critics and Bartlet considered that Raven did not answer what he considered to be the crucial question whether Christ in the centre of his personality is human or divine³². For his part Raven felt that it was futile to press this question if, as he believed, "God and man are one in Christ"^{22f}. "If the question be pressed whether Jesus is human or divine in the innermost core of his being", wrote Raven, "we shall reply that this again is based on a misleading analogy, the assumption that the problem is one of contact between two individuals, and that as between full human personality and the universal reality of God the analogy is demonstrably false. God is not an individual: even personality is a term so inherently associated with human limitations as to be inappropriate: the personality of the Incarnate is human-divine, and not the less human nor the less divine by reason of the perfect fellowship or union of the two in him"^{22g}.

Raven shared the general tendency of liberal modernists to blur the distinction between God as Creator and man as creature³³ and his critics felt rightly that "he was apt to confuse the *affinity* of God and Man with something that suggested *identity*"³¹. "God is indeed revealed in the perfect manhood of Jesus", wrote A.M. Ramsey. "Yet perfect manhood is not itself Deity, and it is no disparagement of the work of the divine Logos in the human race if we insist, far more than Dr. Raven seems to allow us, upon the sheer *paradox* of the Incarnation as the act whereby one who is Creator took upon himself creaturely, finite and mortal existence". Ramsey realised that Raven would regard such a statement as being Apollinarian, but he urged that "so far from being Apollinarian it is inherent in the New Testament testimony"³⁴.

Ramsey also considered that Raven had no doctrine of election³⁴, but, in my view, a more severe criticism of his theology is that he blurs the distinction between God and man. This leads to an inadequate view of the holiness of God, which in its turn results in an inadequate view of sin.

2.2 Soteriology

The doctrine of the Atonement was closely related in Raven's thought to the doctrine of the Incarnation, for he viewed Jesus not only as "the expression of deity" but also as "its instrument in fulfilling the divine purpose"^{29b}. That purpose was "to bring

men through the influence of love into the same relationship with God as he himself possessed, to make them sons of God because sharers (*sic*) of his own Spirit of Sonship"^{30h}. Just as he had virtually identified the deity and the humanity in Jesus, so Raven came virtually to identify the Incarnation with the Atonement.

Raven held that the doctrine of the Fall as traditionally understood had a place in theology entirely out of line with its place in the thought of the Apostle Paul for whom it was "by no means a fundamental concept"^{25b}. Raven contended that in Romans 1-3, Paul never suggested that all mankind is corrupted by Adam's sin and that even in Romans 5:12-14 he has in mind the primary guilt of Eve rather than the abiding effects of the Fall. "St. Paul makes it clear that death, when once introduced as a punishment for Adam's disobedience, became universal: but he explicitly states first that until the giving of the Law there cannot be sin in the full sense and secondly that even those who did not sin as Adam had done were still subject to death. It is hard to believe that such ambiguous language would have been used if St. Paul had held strongly or clearly the traditional doctrine of the Fall"^{25b}.

Although Raven rejected this doctrine he knew that the fact of sin must be taken seriously, since it involved separation from God^{30l}. Man needs to be delivered from the burden of sin and this becomes possible as we love Christ and our lives are transformed³⁰ⁱ. "If man is the image of God", wrote Raven, "then potentially every one of us should reflect as in a glass the splendour of the divine. As men it is our privilege to cleanse the mirror of our soul and turn it so that heaven's own light can fall upon its surface. For all of us the mirror is blotted by sinful actions, distorted by pride: in all of us God's image is hard to trace"^{30j}.

Raven at least in his early days held an exemplarist view of the Atonement: Christ, he wrote, "knew that only an agony of the fiercest pain and scorn and failure that men could ever pass through ... would make his appeal for love irresistible"^{30k}. "Man could only be brought to realise the depth of his own wickedness and yearn for a way of escape, if he were confronted by a single example of the grim consequences of evil, and that the cost of such an awakening must be death of the innocent"^{30l}. Writing in 1931 Raven noted that "Anselm's theory of Atonement represented the spirit of the age at its best"^{22h}. Raven developed this thought further after he had read Aulén's *Christus Victor*, which was published in English that year. He concluded that the history of the doctrine of the Atonement was a response to the characteristic needs of the age^{25a2,3b} and so there was need for a new concept of Atonement to meet the present age. He recognised that such a concept had yet to be developed but thought that it would be "in terms of unity and the opening chapters of the Epistle to the Ephesians"^{25a2}.

Raven can be criticized on the ground that he uncritically accepted Aulén's so called "classic view of the Atonement" and seems to have completely ignored Camfield's very damaging criticism of it³⁵. However, my main criticism is that Raven's understanding of the Atonement is exegetically dubious. In maintaining that the idea of the wrath of God is "a misinterpretation of the Father's character"^{29b} and in failing to take note of the Pauline statement that we were once "enemies of God" (Romans 5:10), Raven is in fact minimising the alienation of man and God. In his general approach Raven appears to have been influenced by Wescott and Hort who regarded 'reconciliation' as involving a change of attitude of man to God and not also of God to man³⁶. In Raven's account of sin there is no recognition that although the impress of the Creator remains on his creation it has been blurred by sin. Although Raven recognised that when Paul wrote 'the creation was subjected to futility' (Romans 8:20) he had "in mind the story of the curse upon the earth and its human inhabitants in Genesis 3"³⁷, Raven does not appear to have recognised that in some ways creation was bound up in sin and its consequences. For these reasons Raven's hamartiology must be deemed inadequate.

In order to refute the doctrine of man's depravity as traditionally understood, Raven cited many references to eternal life in the Fourth Gospel. If man can experience in the present world life of a quality to be called eternal, "then the antithesis between nature and supernature becomes absurd, and the total corruption of the natural must be abandoned"^{25c}. Raven appears to have ignored the fact that "from the beginning to the end of his Gospel, John emphatically points to *faith* as the way to the reception of salvation"³⁸. Man must be born again if he is to experience the life of the age to come (John 3:16).

The Pauline emphasis on faith in Jesus Christ as the appropriate response to the Gospel is also missing in Raven's description of the Church as "the fellowship of those who live in Christ and by him are incorporated into his body that is the Church. No initiation except that of sharing in his sufferings can admit us to it: no sacrament save that of daily dying and rising again can sustain use in it: no priesthood but that of the Christ-possessed ministers to it: those who are led by the Spirit of God, be they Jew, Turk, infidel or heretic, are within its membership: all mankind belong to it having eyes they see, if their lives display the fruits of the Spirit, if they have love one towards another"²²¹. One agrees with Visser 'T. Hooft and Oldham that such a concept leads logically to an inter-religious community³⁹.

2.3 *Christ and the Universe*

The doctrine of Christ forms for Raven the key to the interpretation of the total cosmic process. Dillistone has argued that Raven regarded evolution as being "capable of bringing into a single harmonious system the traditional faith of Christendom and the amazing new understanding of the universe which modern science has discovered"^{5c}. I would agree with Carpenter's criticism of Dillistone at this point for this is a misplaced emphasis. "For Raven it was precisely the doctrine of Christ which illuminated the concept of evolution. Though that concept threw enormous light on the doctrine of Christ, providing a chief interpretative tool for the understanding of Christianity, the meaning of the evolutionary process itself derived from the doctrine of Christ"¹. In Raven's eyes "life abundant is both the goal of evolution and the purpose of Jesus"^{25b2} and Christ's sacrifice was "the culmination and consummation of the whole creative-redemptive process"^{25c2}. Christ is "the climax and illuminator of the universe, the archetype and the goal of the life of man"^{3c}. Almost at the end of his life, Raven expressed his ideas in words which in both conception and language are comparable to those of the French Roman Catholic palaeontologist Father Pierre Teilhard de Chardin whose biography he had just written⁴⁰:

In these great sentences (Ephesians 4:13-16) the biological principle of symbiosis, a new principle at the level of the universal human divine community, has found expression. For us it is the coinherence, the Christification, of mankind in a single organic personality. Like the atoms in the molecule, like the cells in the living creature, like the chromosomes in the zygote, like the analysable elements in the integrated individual, like the several members in the family-life of our dreams, the particular men and women thus combined by the unifying energy of the love of God in Christ emerge as a veritable incarnation of his Spirit in the world. Just as love has been disclosed as capable of release from the twin distortions of exploitation and sentimentality, as a new fulfilment of past aspiration and present creativity, and as the attribute of God himself, manifested for us in terms of our humanity by Jesus and made universally available as we share his Spirit, so now we catch a glimpse of the vast and differing peoples of the world transformed in Christ into the fellowship of a true commonwealth, sharing the same loyalty, serving the same cause, and inspired by the same love. Such a community would live as Jesus lived, in the world but with God; its individuals would find in their membership one of another their own freedom and fulfilment, and its unity would discover for them in the changes and chances of our mortality the permanence of the abiding values and the reality of eternal life"^{37b}.

Raven felt that any materialistic interpretation of evolution was inadequate. In his book *The Creator Spirit* he interpreted evolution in terms of 'emergence', a concept which had been developed by C.L. Morgan in his Gifford lectures, *Emergent Evolution* (1923) and *Life, Man and Spirit* (1926). In this account of the evolutionary process genuinely new levels (or 'emergents') came into being which were not explicable in terms of previous levels. Life and mind were such new emergents. But if this is the case they were in continuity with the lower levels. The process of evolution he believed was the result of the divine activity in nature. But it was essentially an immanentist concept with no clear picture of purpose, direction or goal. Although these ideas were accepted by Raven and Teilhard de Chardin, their overtly immanentist overtones have prevented the acceptance of Morgan's views by many theologians⁴¹.

Although the concept of emergence as a scientific theory still figures in some evolutionary thinking, it has not been widely accepted⁴². Raven regarded it merely "as supplying the least unsatisfactory schema of the evolutionary process"^{22j}. It was rather in the general description of creation set forth in Romans 8:18-39 that Raven saw an account which "a scientist could accept as congruous with his own insight into evolution"^{3d}.

Cairns⁴³ has suggested that Raven has made a creative contribution to the problem of evil and suffering by regarding the power of God as not being physical power raised to the 'n th.' degree but rather the suffering power of love. Creation is not a thing once for all completed, but a continuous process in which through the travail pangs of nature and mankind "the sons of God" are being brought to birth. While one can be grateful for this stress on the suffering power of love, regrettably one feels that Raven reinterprets rather than expounds Paul's thoughts in Romans 8:18-39 and that in this passage Paul is not setting out "an account of creation" but rather showing in Nygren's words that "the redemption of mankind is also to be the redemption of creation"⁴⁴.

2.4 Pneumatology

In Raven's writings there is a discussion on the relation of the Holy Spirit to the world in general. Unlike some of the Fathers, Raven preferred to speak of the Spirit, rather than the Logos, in connection with the divine activity in nature and in the human race; and he went further in describing the Spirit not only as the author of what is good and true but as identifiable with those human qualities and potentialities which others prefer to call 'the divine image'. He valued highly the description in the Nicene Creed of the Holy Spirit as 'the Lord and Giver of Life' and wrote "that in our faith in the Holy Ghost as the Giver of Life we have warrant for believing that he is operative not only in the edifying of the

saints, but in the whole process of evolution; that we should enlarge our conception of him by tracing his works, as the Greek Fathers did those of the Logos, in the whole self-revelation of God; that we should claim nothing less than the whole sphere of experience as the scene of his activity; and that doing so, we should set our faces not only against the dualism of natural and supernatural, but against a conflict between scientific and religious truth"⁴⁵.

Raven's doctrine of the Holy Spirit has been severely criticised by W.D. Davies who suggested that Raven's doctrine leaned "more to Stoicism with its *pneuma tou kosmou* than to that energy full of power, strength and life that he is designated by *to pneuma to hagion*. The Spirit in Paul is not 'the manifestation of the same Godhead in the cosmic process of which humanity is for us the consummation and Jesus the crowning glory (*The Creator Spirit*, p.28)'; it is on the contrary, however unsatisfactory such language must be, a gift poured forth from on high; it is supernatural, it retains the sense in Paul as in the Old Testament of 'a specially given energy'⁴⁶". Raven sought to refute these criticisms^{25d2}, but the fact remains that Raven's doctrine was a *re-interpretation* of rather than an exegesis of Scripture. There was thus a conflict between Raven's broad theological understanding and the requirements of rigorous Biblical exegesis, for in the New Testament "the term Holy Spirit refers almost exclusively to the new order, the new age, the new community in Christ"³¹.

2.5 *The Doctrine of the Trinity*

Raven's attitude to the doctrine of the Trinity developed over the years. Writing in 1916 he felt that the historic definitions of the Christian faith as expressed in the Creeds "enforce on us precepts as to the pre-existence of Jesus and his relation to God as to the second Person of the Trinity, when we feel that such subjects are within the realm of speculation and possibility rather than of certainty"^{30m}. "We do not admit", he wrote, "that metaphysical doctrines have in themselves much religious value, as long as Christ's uniqueness and completeness is maintained. No doubt they have some independent worth, and a proper place in the Christian scheme of things, provided their importance is not exaggerated. But it is abundantly plain that far too much attention has been and still is devoted to them and that this undue emphasis is positively injurious to Christianity. For not only does it give unbelievers cause to blaspheme our faith as a thing vainly imagined and most presumptuous, and to instil doubt into the hearts of many who else would confess Christ openly; but it distracts the attention of the orthodox from Jesus to the Trinity, fosters an unreal conception of his significance, and prevents the appreciation and use of the truth of his manhood"^{30m}. A few years later Raven referred to "Life, Light and

Love, the great Johannine Trinity" as representing "an entirely different conception of God, a conception which alone enables men to pray 'Our Father' and alone gives an adequate explanation of the motive of the Incarnation"⁴⁷. This somewhat unguarded language led Green to suppose that Raven wished to substitute Light, Life and Love for Father, Son and Holy Spirit⁴⁸, a supposition which Raven vigorously refuted, pointing out that "no such analogy between the Johannine categories and the Persons of the Trinity is suggested. Light, Life and Love belong to the unity or 'substance' of Godhead"^{22k}.

By 1928 Raven was able to adopt a more positive attitude to the credal statements concerning the Trinity: although he preferred to use the term "mode" to avoid any idea of tritheism, he accepted the use of the term "person", if "person be stripped of all that denotes an individual or separate self"^{29c}. Subsequently, he discovered to his great surprise that Karl Barth also proposed dropping the term "person" in favour of "mode"^{25d2}. Raven was very conscious of the dangers of tritheism and felt that William Temple in *Christus Veritas* emphasized "dangerously the distinction of the Persons of the Trinity"^{18c} and that Bishop Gore in his book *The Reconstruction of Belief* gave the impression that he was maintaining "a concept of God as of three individuals enthroned in a spacial heaven, one of whom sends us the second that he in turn may send the third"^{22l}. There was an element of truth in these criticisms for there was a tendency in Anglican theology, as Ramsey admits, to use the term "person" loosely in a way that was rather suggestive of tritheism⁴⁹.

3. Raven's Influence

Both Maa Warren⁵⁰ and Ian Ramsey⁴ have testified to Raven's great influence as a preacher. Although none of his major books was translated into other languages, he was in his day immensely influential as a theologian. However, he is largely neglected today and A.M. Ramsey in his survey of Anglican theology from 1889 until 1939 in his book *From Gore to Temple* devoted only just over one of its one hundred and ninety two pages to Raven's theology. This led Raven to complain that Ramsey "treats Christian truth as if it were measurable by the disputations of the patristic age or of the Reformation" and "that subjects which seem to many of us absolutely vital — the commending of the faith in relation to the new social order and new cosmology — are rarely even mentioned"⁵¹.

Raven was one of the few theologians who was concerned with the relationship of science and the Christian faith. At a time when those scientists who were Christians wrote books defending the truth of the Bible⁵², Raven sought to bring scientific and religious truth into a harmonious whole. He had considerable influence on C.A. Coulson who was to become not only one of the world's most

distinguished theoretical chemists but also Vice-President of the Methodist Conference⁵³. During a good part of his life he devoted as much attention to religion as to science and his book *Science and Christian Belief* was to achieve wide circulation, especially when it was reprinted in the Fontana series. In many ways he was a disciple of Raven, believing in Raven's words that "life abundant is both the goal of evolution and the purpose of Christ"^{54a}. Moreover, his understanding of creation very clearly betrays the influence of Raven:

For evolution, the story of man, traced for us by the scientist, is seen as the travail of God's energy, creating man in his own image. No wonder it is shot through with pain and sacrifice and blood, like the travail of a woman with a child. All things may be part of a great design; but it is a living, growing, developing pattern, if God is in it. Here, and here only, is the beginning of our understanding of that 'sublime law of sacrifice' which Fabre saw throughout the animal world; and, no less, of that 'groaning' of the whole physical creation which St. Paul has described for us in his letter to the Romans. For creation, and Nature, and man, these are not what God does, but what he is. The only interpretation that will do justice to them is in terms of love and sacrifice, linking them all together in the bond of God's being^{54b}.

The liberal tradition in theology has continued to exercise an influence on scientists such as A.R. Peacocke and L.C. Birch. Peacocke has acknowledged his debt to Raven⁵⁵ and, although Birch like Raven rejects "the concept of God's operation in the universe as a series of fitful interventions from a supernatural sphere overlaying the natural"^{56a}, he has been influenced by the process philosophers more than by Raven^{56b}. However, many practising scientists who are Christians are either followers of Raven's arch-enemy Karl Barth⁵⁷ or else conservative evangelicals. R.E.D. Clark, who was one of the founders of the Research Scientists' Christian Fellowship (RSCF) has acknowledged his great debt to Raven for his criticism of mechanistic evolution in *Science, Religion and the Future*⁵⁸ but the publications by members of the RSCF⁵⁹ maintain the antithesis between nature and supernature which Raven regarded as "absurd"^{25c}. They seem to have been considerably influenced by the historian of science R. Hooykaas⁶⁰ who said in reviewing the first volume of Raven's Gifford Lectures "A synthesis of science and theology into one system, as seems to be Dr. Raven's ideal always ended in the adulteration of both. However, that there must be a perfect *harmony* between them has been the conviction of the great founders of modern science who share Dr. Raven's love for the Book of Creation"⁶¹.

Raven's *Apollinarianism* (1923) was his one work of pure theological scholarship and it remains, in the words of Dr. Henry Chadwick, "a landmark in the study of a great subject"^{5d}. His biography of Teilhard de Chardin did much to bring Teilhard de Chardin's ideas to the attention of English-Speaking people. However, although these ideas now have little appeal to the practising scientist, they still have some appeal in theological circles⁶².

4. Conclusion

Anyone who studies Raven's writings cannot but be impressed by the width of his scholarship, his passionate desire to commend his Christian faith to others and his aim to present a unified view of truth. However, Raven's presentation of Christian doctrine involves its re-interpretation and one does not know what criteria are employed in deciding which doctrines should be re-interpreted and the manner in which they should be restated. Moreover, Raven's concern for unity leads him, as Dillistone appreciated to over-simplification and a neglect of ideas that did not fit into his scheme^{5e}.

A number of detailed criticisms can be advanced against Raven's theology and these in the main arise from the fact that his broad theological understanding is in conflict with the requirements of rigorous New Testament exegesis. However, my basic criticism would be that his theology is subjectivist, a criticism he himself rightly levelled against Karl Barth⁶³: every opinion must be held on the basis of some authority and it is not clear what constitutes Raven's authority. Romans 8:18-39 is in many ways a key passage for Raven but although he recognises that Paul has in mind the story of Genesis 3, he completely neglects the implication that the creation is in some way bound up with man's sin. This is particularly surprising, since Sanday and Headlam, whose commentary Raven cites^{37c}, recognised that "creation ... had been enthralled to death and decay by the Fall of man"^{36b} and Raven regarded the "truth and relevance for us of Paul's interpretation" of this passage as being "in the best sense prophetic"^{37a}. Likewise Raven rejected the notion of God's wrath as being incompatible with the nature of God, yet both wrath and future judgment are present in the Fourth Gospel⁶⁴ to which Raven appealed in order to refute the traditional doctrine of man's depravity as well as in the Epistle to the Romans. One is left with the impression that Raven's own deep faith in Christ is in unresolved tension with his "liberal" views concerning the authority of Scripture and of the historic Creeds.

Raven represents a fine tradition in English theology and if in the end his theology is judged deficient, it is because the universe does not permit the enlightened reconciliations to which he devoted so much effort. His virtual identification of deity and humanity in Jesus and the identification of the Incarnation and Atonement leads in the end to an unsatisfactory view of God, man and sin and it seems, at least to the present author, that Raven merits Anselm's rebuke "You have not yet considered what a heavy weight sin is"⁶⁵.

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- 7 Strangely, Dillistone (ref.5) makes little reference to this friendship apart from describing Raven's visit to him when he was a curate at Stoke-on-Trent. Raven did not mention his name in his autobiography *A Wanderer's Way* and Dillistone presumably did not identify him. Nonetheless Dillistone's neglect of him is surprising since Raven said "His influence on me was certainly stronger than of any others save my mother and my wife"⁶⁶. Hare was one year older than Raven but he entered

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- 61 "Science and Religion", *Free University Quarterly* (Amsterdam), 1954, 3, 205-211.
- 62 E.g. P. Feaser, "Science and Christ", *The Fraternal* (Journal of the Baptist Ministers' Fellowship), No.187 (April 1979), pp.13-21.
- 63 Ref.22, p.58. This was Raven's most perceptive criticism of the theology of Karl Barth, although he never developed this point or mentioned it in his later publications.
- 64 There is a considerable amount of literature on the eschatology of the Fourth Gospel. Reference may be made to C.K. Barrett, *The Gospel According to St. John*, 1955, pp.56-68; R.E. Brown, *The Gospel According to John*, Geoffrey Chapman, 1971, Vol.1, pp.cxv; G.E. Ladd, *A Theology of the New Testament*, Grand Rapids, Michigan, 1974, pp.298-308, and the references cited therein.
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ESSAY REVIEW

PHILIP KITCHER'S "ABUSING SCIENCE"

This is an entertaining book — one even wonders at times if the title, *Abusing Science*, might be a misprint for *Amusing Science*! Its aim is to help poor beleaguered teachers in schools and colleges against whom, so the author assures us, a vast gang of polite, well meaning, but indoctrinated young Creationists are plying awkward questions which teachers cannot answer. So our kind author, hoping to save the day for real science, has spent a field day exploring the writings of the Creationists. Here he sets forth their arguments and the correct answers thereto. In doing so, he has had the help of many orthodox evolutionists, including Stephen Jay Gould, Richard Lewontin, Gregory Mayer and others, all of whom have evidently racked their brains to discover the best way of answering Creationist books with such provocative titles as *The Sciences know nothing of Evolution*; *Evolution: the Fossils say No* and *The Great Brain Robbery*.

Many of the arguments used by the American Creationists are so naive and irrelevant, that the reader will enjoy many a good laugh. But for all his fine writing one cannot help feeling that they will sometimes also enjoy a laugh at Mr Kitcher's expense. He seems so worried about definitions of such words as 'species' and 'kind' about which Creationists fall to enlighten him, that, apart from the trivial statement that "species are not fixed and immutable" (p7) he tells us much too little about what he means by the evolution which he so strongly espouses.

Let us try to help him. In so far as evolution refers to a temporal phenomenon, one which is concerned with a 'before' and 'after' (as distinct, say, from the evolution of a mathematical curve from an equation) evolution is commonly and correctly taken to mean something like this. It means that when we compare a late (after) state with the earlier (before) state of affairs, we find common features which we take to indicate that there is a connection between them. An earlier city might evolve into a later city, provided there were some landmarks, institutions, or perhaps only the descendants of the earlier inhabitants still living there. If an early ship evolves into a later more sophisticated one, the latter must have some features (a rudder, a mast perhaps, some means of propulsion, the same general shape etc) as the earlier form if we are to speak of evolution. (No one would claim that a modern passenger liner is an evolved form of a water boatman!) An early motor car has wheels, an engine, a steering device etc. like its later evolved counterpart. Evolution is also often taken to imply greater complexity, or greater adaptability, in the later than in the earlier forms, but this is not always so.

Rocks evolve under pressure, volcanism etc. Earlier fossils of fish may show features which are common with later forms, and so on. In all such cases when we speak of evolution we ask, What are the forces, influences, factors etc. responsible for the evolution? Do they lie *within* the earlier form and its environment (intrinsic evolution), or are they *imposed* upon it from the outside (extrinsic evolution)? In the evolving universe, galaxy, star or rock, science assumes that they are intrinsic; in the evolving ship or motor car they are extrinsic. But what about fossils and organisms generally? Kitcher is strangely silent.

The author's aim is to prove that biological evolution is a science, but that 'Creation Science' is not. He rightly points out that a science demands an internal discipline and cohesion. So-called Creation Science falls down here: it may be true but it is certainly not science to say that the peacock has beautiful feathers to please its mate, that God gave wings to birds so that they might fly or that He designed clouds, rain and rivers to water the continents. Applying Popper's falsification test (in its naive form) we might say that there is no conceivable way in which by observation or experiments, we might falsify these statements.

Creationists reply that Popper's test likewise disposes of the claim that biological evolution is science. You cannot falsify the theory that a particular creature was endowed with legs or a tail as a result of natural selection: even if an 'evolutionist' invents a scenario to show how it might have happened and you prove that the scenario is wrong, an evolutionist will soon pop up with another suggestion. So if you persist in pressing home the naive form of the falsification doctrine, says Kitcher, science will cease to exist altogether. "One can appeal to naive falsification to show that *any* science is not a science" and Creationists have "failed to find some fault of evolution not shared with every other science." (p.44) This is simply not true, as a glance at almost any issue of the *Quarterly Journal of Creation Research* might have shown him. Because he forgets to distinguish between extrinsic and intrinsic evolution he fails to realise that biological evolution is not a scientific theory because it is not a theory at all, but a million theories. How come that, in nature, vast numbers of wonderfully clever mechanisms have come into existence? If these arose from within the natural order, one might have thought that each would necessitate a new branch of science: one to arrange atoms and molecules into the form of backbones, another to make brains, others to create the mechanisms of photosynthesis, the root systems of plants, the inventions necessary to ensure that trees can draw up sap to more than 32 feet; others to devise molecular structures to stop the blood of Arctic fishes from freezing, to make nitrogen fixing mechanisms for plants, wings for birds and butterflies, and so on endlessly.

It is useless, surely, to dismiss the whole show by citing trivia like the change in the ratio of dark to light coloured moths in an industrial countryside. Intrinsic biological evolution cannot, in short, be a science. Nor can extrinsic either, for that would be Creation Science. Before writing this book Mr Kitcher would have done well to study Pierre P. Grasse (see this JOURNAL 107, 214) whose biological credentials are second to none. All this he ignores. Instead he quotes Ernst Mayr with gusto, "The theory of evolution is quite rightly called the greatest unifying theory in biology" (p.54). And so it is - but only in a semantic sense!

Though any fair minded person must agree that Creationists have too often misused science to support their cause, Mr Kitcher seems quite able to do the same. For instance, he mentions Lord Kelvin's argument that there had been too little time available for evolution by natural selection to account for the organisms we find in nature (p.100). Drawings of domestic animals executed by the ancient Egyptians show that these animals have not changed in 4000 years, so evolution must be very slow indeed. Kelvin, who calculated the age of the earth both on the basis of the cooling of the earth itself and of the cooling of the sun, assumed that it derives its energy by contraction. He concluded that since the time available was insufficient "an evolutionary account of the entire development of life cannot be correct. We now know that Kelvin was wrong. Although his concerns were entirely justified, his argument rested upon a mistake about the earth's age because nothing was then known about radioactivity. We now know that the earth is older than Kelvin thought possible, so that evolution is quite possible after all, yet Creationists have 'dusted off and refurbished' Kelvin's arguments."

This sounds plausible enough but what Kitcher does *not* tell us is that Kelvin's upper estimate for the age of the earth was 1000 m years. It just will not do to say that Kelvin was right according to the knowledge available to him, but to claim that evolution becomes possible when the age of the earth is increased by a mere factor of 4. Wisely refraining from giving figures Kitcher implies that the new estimates of the earth's age are several orders of magnitude greater than the old.

Next, Kitcher attacks Henry Morris's (1972) treatment of the probability argument against evolution, claiming that Morris has conflated apparent and irreducible randomness (p.104). He does not seem to realise that if the improbability of the, let us say, million, small changes that are necessary in passing from a primitive to an advanced organism are apparent only, the evolutionary process must have been enshrined in the first organism from the start, so that the difficulty in accounting for evolution is merely pushed back a stage. Kitcher does not seem to realise how difficult are the problems he must face and his claim that Morris's "computations are designed to bamboozle those who become weak at the knees at the sight of numbers" might fairly be used in reverse.

Later he has much to say about entropy and evolution where his main plank is that the entropy law only applies in an isolated system. He does not realise that the word entropy now has a wider connotation than it had when it was first coined and even when Morris states the general law of entropy increase correctly he is merely told that he has shifted his ground (p.94) — Morris (I think) is often very wrong but even when he is right his statements tend to be dismissed as "Morris's tastier red herrings": Coming to the dinosaur and human tracks in the Paluxy river, Kitcher is merely dismissive since they ill accord with orthodoxy. He shows no interest whatever in whether the tracks are genuine. Coming to the fossils he launches a long and entertaining attack on Duane Gish, one of the best informed of the US Creationists, but here I do not feel competent to comment.

Often, Philip Kitcher's criticisms seem valid enough though sometimes one feels they could have been more convincingly stated. But Morris often has him on the hop — just how does one argue with a man who declares that Nimrod built Babel (apparently to be identified with Babylon which appeared on the scene some thousands of years later) where the devil taught him all about evolution? As for sociobiology Kitcher dismisses the harmful effects of evolution on society on the ground that truth can often be misused — witness the Crusades, slavery and apartheid, all defended on supposedly Christian grounds. What we are not told is that Darwin himself definitely encouraged the bitterly antichristian biologist Haeckel who built his Monist philosophy (which profoundly influenced Hitler) on evolution.

There is much in this book with which to agree and to disagree. The author is not anti-religious though he thinks that Christians should allow for more poetry in the Bible than do the Creationists; he acknowledges that many Christians accept evolution without difficulty. The book will help to scotch some of the silly things that are being said by some Creationists but let us hope that it will draw attention, too, to the silliness of some evolutionists. May the critical youngsters in US schools and colleges continue to embarrass their teachers with awkward questions!

REFERENCE

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ESSAY REVIEW

THE FINDING OF GOD

Hoyle and Wickramasinghe's *Evolution from Space*¹ is a fascinating book; full of intriguing ideas. Over the past few years the authors have come to the conclusion that by no stretch of imagination can life have come into existence by chance on the earth's surface in a primitive soup of the Haldane-Oparin variety, nor, having once come into existence, could it, of itself, have advanced slowly producing more and more complex forms by the Darwinian or any other known mechanism. If based on known scientific laws, every sensible calculation of the probability that such events took place, even after making the most liberal allowances, gives a result so miniscule that it cannot be taken seriously.

A few years ago the authors considered the possibility that what could not have happened on earth might have taken place in space where the quantity of matter and the time available are greater. If the entire observable universe is made available instead of the surface of the earth alone, the probability of the formation of genes might be increased by a factor of 10^{20} . They suggested that such processes might take place in galactic clouds or in heads of comets and that germs of life might be wafted on waves of light — which seems possible if they were of the correct size — and deposited on earth where they could fall slowly through the atmosphere. The suggestion that life might reach earth in this way is basically that of Lord Kelvin, Helmholtz and Arrhenius (though Kelvin, if not the others, insisted that creation by God must take place somewhere, if not on earth).

A century ago it was relatively easy to imagine the spontaneous creation of life, for living cells were then thought of as little more than blobs of protoplasm. Not until quite recently have we begun to appreciate the enormous complexity of living systems. The simplest system will have to contain about 2000 enzymes, each coded for by a gene, if it is to behave as a living organism, able to utilize energy sources, to feed, to reproduce, and so on. The function of an enzyme is to act as a catalyst which ensures that a particular reaction will take place; in its absence chemical reactions may take place in enormous numbers of possible ways resulting in complex mixtures, nearly all the products being unwanted. An enzyme consists of not fewer than a hundred or so amino-acid units arranged in a near precise order and of the units there are 20 variants. Small alterations are possible in some of the locations in a chain provided an amino acid is changed for a similar one

(basic, acidic, hydrophobic etc.) but there are also many locations where no change can be tolerated. The amino acid units in a polypeptide chain attract/repel one another so that when the chain is left in a suitable medium it folds itself up and becomes compact. The resulting three-dimensional shape must be such that the chemicals which are going to react will slide easily into correctly shaped crevices on its surface and, when they have done so, will bring the groupings which are to react into juxtaposition. After this the newly altered molecules must slide out easily, leaving the enzyme ready to perform its function once more.

This is basically how an enzyme works; its highly specific shape and the electric polarities of its different regions, enable it to select only those particular molecules which are needed from the mixture of hundreds or thousands of molecules of different kinds which surround it in any biological fluid. When the required molecules have reacted the new products are formed in yields of 100%. Since life depends upon these enzyme reactions it is evident that even a very slight change in the shape of a folded polypeptide chain will destroy its catalytic activity. Although, as we have noted, changes can be tolerated in those parts of a chain which do not contribute much to the resulting shape, long sequences in a chain are unalterable. In enzymes which do the same work these parts of the sequences are unchanged throughout the whole of nature — they are the same in a bacterium, a yeast cell, a mouse and a man. But there are also parts of the chains where the small alterations already mentioned, are tolerated.

By comparing widely different life forms it is not difficult, then, to find out how many amino acid units must be kept in the correct order. This makes it possible to calculate the probabilities that such sequences will be produced by chance. This, basically, is the argument of this book. The authors calculate that the probability of life cannot be greater than one in 10 raised to the power of 40,000: in fact it is probably a great deal less than this.

This number — the numeral followed by about 40 pages of zeros — is unimaginable. If the chance was one in a number equal to the number of atoms in the visible universe, the probability would be one in 10 multiplied by itself about 80 times, or 10^{80} . For every atom in the universe, put another universe and suppose the event happened just once in all those universes. The chance would now be about 10^{160} (one in 10 multiplied by itself 160 times). Put another universe for every atom in those universes — that gives 10^{240} . We should have to repeat this ridiculous operation many, many, times to reach $10^{40,000}$: In short, calculations of this kind, even if they are only of the roughest kind, rule out all possibility that the event they relate to could ever have happened.

Some of those who have read this book and Hoyle's other writings claim that he has set up an Aunt Sally which he has forthwith knocked down. Through his misreading of biology, they say, Hoyle thinks that biologists take seriously the notion that living cells were synthesised by chance in a single step which is, of course, nonsense of a high order. In fact biologists believe that living forms have been built up as the end product of "sequences of smaller more probable events" which have come about through the process of natural selection (N. Paskin, *New Scientist*, Letter, 10 December 1981). In fact, of course, Hoyle and Wickramasinghe say no such thing. They make it plain enough that it is for the sake of simplicity in the argument that they argue from the single improbable event; this is legitimate because the conclusion is quite unaltered if the improbability of the single event is replaced by the combined improbabilities of smaller more probable events. They stress the point that the 'information' content of a cell must come from somewhere and that it cannot come from the environment (save in miniscule quantity). (That it would still not be available even if natural selection functioned with 100% efficiency is not difficult to prove.)

The plausibility of attempts to avoid the force of the argument can only rest upon the tacit introduction of hidden information-rich factors (programming of alleged properties of life which have supposedly 'emerged' from the complexity of its structural arrangements). If these are taken into consideration, we shall reduce the probability level to one not significantly different to what it was before. To think otherwise is, as Sir Fred says, to introduce a miraculous element into biology, but not into the rest of science; it is to live "in the twilight fringes of thermodynamics" (see his article in *New Scientist*, 19 Nov. 1981).

Having established the main argument the authors discuss further ways in which it might be countered. All, they claim, amount to special pleading and must be rejected.

One way of making the formation of a living system appear more probable is to suggest that any one of an enormous number of possible chemical systems might have been adapted to form the basis of life. Thus some chemists suggested in the past, that silicon might have replaced carbon as the skeleton-forming structure of organic compounds, or that many chemical substances other than carbohydrates might be used as sources of energy. No responsible scientist thinks that such options remain open today.

Chemical linkages involving silicon with either itself or with other atoms vary so greatly in their strengths, that smooth replacements such as are needed in any complex biological metabolic mechanism are altogether impossible. As for carbohydrates, the

authors argue that carbon monoxide and hydrogen are the commonest compounds in the universe and it can hardly be a coincidence that the empirical formula of carbohydrates is CH_2O . The so-called coupling constants of nature determine that when, in the stars, helium combines with itself to form carbon and oxygen, the quantities formed are nearly equal, oxygen being slightly in excess. The existence of life depends upon this fact.

Next, the authors turn to evolution. In the Darwinian scheme there is adaptation to the environment, but the environment has a very low level of information and cannot build systems with a high level. Natural selection is, in fact, biased towards decline. Its function is at best to keep systems from decline, not to build up vast complexity.

Biological systems often possess properties which cannot have come into being as a result of selection. *Drosophila* flies can see well in light of 2537 \AA and it is not a fluorescent effect. But the earth has never been bathed in light of so low a wavelength: this ability can never have been useful to them. Animals have 'found' the critical arrangement of about 10,000 atoms which makes efficient oxygen transfer possible. It is difficult to think that this can have happened gradually with vast numbers of intermediate useless stages: and there is the further difficulty that peas and beans have 'found' it too: hardly by natural selection, for other plants do well without it.

Again, most of the DNA in genes is unexpressed — 90 or 95% in man. But this DNA ought not to be there at all according to Darwin. A remarkable instance is afforded by bacteria which have the power to repair themselves quickly after they have been very seriously damaged by X-rays. On earth this power is of no use to them: they can never have been exposed to heavy doses of X-rays even in the early stages of earth's history.

The authors think that these and other lines of evidence point to an origin of genes in space rather than on earth. They hold that genes and viruses, formed in space, descend to earth. They believe (as did Paracelsus centuries ago) that local epidemics may be so explained.

This theory and also their interpretation of the infrared absorption of light in space which they take to indicate the existence of vast quantities of organic material have occasioned much controversy. Several lines of enquiry suggest that they may be wrong here. (1) If organic bacteria or other small organisms descended to earth from space, it would seem that they must descend to moons and other planets also. But no trace of this organic matter has been discovered on the Moon or on Mars. (2) Optically

active amino acids are not normally found on meteorites (but see this VOLUME of F and T, p.15). Amino acids do sometimes occur in traces but in the form of racemic mixtures which suggest an abiotic origin. (3) The dust in the Taurus cloud in our Galaxy is rich in organic gaseous compounds and here, if anywhere, organic material might be present. However, the dust cloud shows a spectral line at 3.1 μ m which corresponds to ice particles, but none at 3.4 which is characteristic of solid organic material (*New Scientist*, 10 Dec. 1981, p.732).

According to orthodox neoDarwinian theory, gene changes are responsible for an upward rise in complexity. But biologists, Kimura and Ohta in particular, are encountering much new evidence that many, perhaps even all, mutations are neutral in character: they occur quite independently of any real or supposed benefit which they may confer on a species. If this be so, the neoDarwinian theory of evolution by gene mutation breaks down altogether.

In those positions in a protein chain in which substitution of one amino acid for another is possible, it is commonly argued that the rate of change is fairly uniform, so that the number of changes in a given enzyme gives an indication of the time which must have elapsed since the species from which the enzymes were obtained diverged. On this basis it is possible to construct family trees and it is claimed that they closely resemble the family trees which have been constructed on the basis of morphology. Hoyle and Wickramasinghe reproduce a number of these supposed family trees, but point out that although the connections between species at the ends of the branches and twigs may seem plausible, extrapolation to the lower branches and trunks is unwarranted: there is no evidence that the trunks ever did diverge.

Even if neutral mutation does not occur, the neoDarwinian picture is almost certainly wrong for another reason. The chance of a change of amino acid on one of the sites where this is possible is reckoned by biologists to lie between one in 20 million and one in 30 million per generation. This is woefully inadequate if it is to account for the production of a higher from a lower form of life. To arrange even as few as ten aminoacid residues in the correct order for a forthcoming macroevolutionary step by this means would take a prodigious time. There is the added difficulty that when once an amino acid chain came to be arranged in the correct order by chance, there would be nothing to stabilize the arrangement until the new arrangement was stabilized by natural selection. The amino acid units which had begun to take up the required order would soon step out of line. "The situation is like a plumber's nightmare -- no sooner is a leak repaired in one place than another starts up somewhere else."

Whether genes were created on earth or whether they were created in space, as Hoyle and Wickramasinghe think, it is, as they say, intellectually impossible *not* to think that they are the result of an Intelligence which lies at the back of nature. "Such a theory is so obvious that one wonders why it is not widely accepted as being self-evident" write the authors (p.130). The reasons, they believe, are neither rational nor scientific but psychological.

The authors contrast their position with that of Dr. Ohno (*Evolution by Gene Duplication*) who, in order to fix neutral mutations requires the ancestral breeding group to be small. The genes then change in directions which have little to do with natural selection and can drift, even in a reptile, to a form which will later be of use to man. Then Dr. Ohno asks, "Did the genome of our cave-dwelling predecessor contain a set or sets of genes which enable modern man to compose music of infinite complexity and write novels with profound meaning? One is compelled to give an affirmative answer"! (p.103) That is, chance not only created enzymes of incredible complexity but produced genes "capable of producing the symphonies of Beethoven and the plays of Shakespeare". What further disproof of orthodox evolutionary theory could one want? we are asked. Creativity is to be explained, not in terms of mind, but in terms of material genes, an 'explanation' just about as antiprobabilistic and antiscientific, as could well be imagined!

The authors find that many biologists who read their book agree with the facts but reply, "I just cannot bring myself to face the upheaval in my thinking that would follow if I agreed with anything you say" (p.137) Again, 'Occam's razor', in perverted forms, is used to refute them. The discussion on this issue is interesting.

The brilliance of the mathematics performed by the Intelligence which must lie behind nature is truly fantastic. The basic problem is this. Imagine a piece of string to which are fastened pellets of different sizes and shapes and imagine that the various parts of these pellets are charged positively or negatively. Put the string in water and imagine that some parts of the pellets are attracted to the water and others repelled. Left to itself the string will fold up and the precise shape which it will take will be determined by the mutual attractions and repulsions of its parts and of these with the surrounding water. The number of conceivable ways of folding would be near infinite but it can readily be imagined that to calculate which one would actually be realised might take all the available time of all the computers in the world combined! Even the simplest calculations of this kind are beset with difficulties and at present headway can only be made with the very simplest of molecules, with two or three units in a chain perhaps. But to make genes there must have been previous decisions as to what shapes

were required in order to catalyse each of the many reaction types which would be necessary in a living system, followed by calculation as to which amino acids, and in what order, would fold into these shapes. Even after that the Intelligence must have been faced with the difficulty of deciding on what order the bases in DNA must be arranged to code for these shapes, and the need to invent machinery able to convert the DNA code into actual enzyme (or other protein) molecules.

The problems the Intelligence must have faced boggle the imagination but what we find in nature cannot possibly have come about by chance: the structures must have been precalculated. And the problem is one of intelligence, or calculating ability. This conclusion is reached reluctantly. Only a year or two ago, the authors say, they had hoped that it might have been possible for life to have emerged if the opportunities for it to do so were enlarged by utilising the arena of space, rather than the limited opportunities available on the small planet Earth. (p.31) But it could not be done. Now at last they have bravely advanced where reason leads, only to be met, they say, by a wall of silence from their fellow scientists who were expecting the ugly (to them) word 'purpose' to appear sooner or later!

In Chapter 9 the authors struggle to avoid "the trick that is played in all religions, namely to displace all problems to God and then refuse to discuss them any further." Here their attempts, though laudable, lead to some rather unconvincing speculation of little value, or so it would seem. Thus, since silicon is used in computers and the computations on which our universe is based are so superastronomical, they talk of a silicon chip kind of God. More helpfully we are told of the lucky 'accidents' of physics that make life possible; these too must form part of the creation picture. There are coupling constants of the universe which determine the ratio of oxygen to carbon, a ratio vital for life. The properties of the elements and of galaxies show further evidence of design. Added to all we are told that many have a feeling that they are surrounded by intelligence all the time. (Here a Christian would prefer to think, perhaps, of the sense of love and care rather than intelligence.)

Finally there are two appendices. One deals with the dishonesty of Darwin in pretending that the idea of natural selection is a creative power was his own when, in fact, he derived it from Edward Blyth. The other is mathematical and deals with the composition of the clouds of matter floating in space.

This is an important book which ought to be read by layman and scientist alike. Clifford Longley, the religious affairs correspondent of the *Times* has commented on the rather sad fact

that theologians have taken a century or more coming to terms with Darwinism but now it is beginning to appear that Darwinism is wrong after all. It is encouraging to remember that Fred Hoyle has long been in the atheist camp (except I think for one promising lapse) but now, as a result of sheer force of fact and his own intellectual honesty, has come to find in science a proof of God's existence. Their idea of God, though he tells us little about it, is not that of the Christian God as yet (Wickramasinghe is said to be a lapsed Buddhist) but it is a magnificent beginning.

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REDC

ESSAY REVIEW

THE PANDA'S THUMB¹

Stephen Jay Gould of Harvard University is a delightful writer, his English impeccable, his armoury of subtle allusions and anecdotes seemingly inexhaustible. What he writes is worth reading.

Gould is a strong critic of the fundamentalist antievolutionism now so widespread in the USA. The purpose of this book, like other writings by its author, is not only to amuse and to instruct, but to show how foolish antievolutionists can be and how obvious it is that Darwin was always (or nearly always) right and his opponents always (or nearly always) wrong. Above all he wants to demonstrate how silly it is to suppose that God rather than evolution created the creatures that swim, fly and walk this earth.

I wish I could write as beautifully as does Stephen Jay Gould: I envy the skill with which he musters his fund of biological knowledge. But somehow there is something missing. For on reading his book I was quickly impressed not by the force of his arguments but by their weakness. It seemed to me, and still seems, that he utterly fails to notice when what he says can be used with effect against him.

Take the opening chapters, for instance. Gould makes the point that what we see today often enshrines a history of a dim and distant past. Here he draws an analogy between biological organisms and the words we use in conversation, both of which enshrine the past. Thus curious spellings, which seem so at variance with how we pronounce the words today, point us to a remote and meaningful past. Sometimes useless syllables may be present: they are clues which reveal what the words used to mean before meanings changed with time. These relics of the past will remain with us, awaiting the day when clever philologists will learn to unravel the long history of the evolution of words concerned. Animals, too, have useless organs being like words have been built up in the course of evolution out of parts which, often enough, performed some totally different function in a remote past.

It was thoughts such as these that gave rise to the title of this book - *The Panda's Thumb*. The panda uses its thumb deftly to strip the bamboo shoots, its only source of food. But look at its hand. There are five fingers apart from the thumb, and anatomically the thumb is not a finger at all; it is derived from another disparate bone. *Procki*, if proof were needed, of a distant

evolutionary past.

Then there are the orchids too, so dear to Darwin's heart. Here again the wonderful adaptations are derived not from specially created parts as we might expect if the creationists are right, but from organs which had other uses in the past. And so, to quote Darwin, "throughout nature almost every part of each living being has probably served, in a slightly modified condition, for diverse purposes, and has acted in the living machinery of ancient and distinct specific forms."

So the case against creationism is truly overwhelming. "If God had designed a beautiful machine to reflect his wisdom and power, surely he would not have used a collection of parts generally fashioned for other purposes. Orchids were not made by an ideal engineer ... they must have evolved from ordinary flowers... Old arrangements and funny solutions are the proof of evolution — paths that a sensible God would never tread, but that a natural process, constrained by history, follows perforce." (p.20-24)

Glorious logic indeed! Was there ever an engineer who, in constructing a newly invented machine, did not make full use of parts which had originally been designed for use in other connections? In the vast literature on patents, it is said, only one case is known in which patent agents and patent officers, the world over, were unable to cite a single earlier reference to an invention out of which the new idea might have been said to have evolved. That invention was the zip fastener: the case has gone down in patent history as unique. (See Ivor Catt's *Computer Worship*, 1973: reviewed in this JOURNAL 102, 7).

As for the argument that a clever engineer would leave out useless parts, this by no means always agrees with the facts. I look at my electric typewriter and it is obvious at a glance that some parts were designed to be compatible with a reversing ribbon which has been outmoded. In the deep recesses of at least one model of the Rank Xerox 660 document copier there is a row of neon lamps. On asking a xerox engineer what they are for he replied in effect: "In earlier models they were used to help remove the electric charge on the paper. Now that we remove the charge in another way, the neon lamps, although retained, serve no useful purpose."

If we ask why it is usually desirable to rely on what has gone before, the answer is not far to seek. An engineer who had to re-design every nut and bolt on his newly invented machine would never get started; nor would the writer who tried to use entirely new words. In biology the task would be even more formidable. To be viable every form of life must reproduce itself. To make the thumb of a panda in such a way that it had no connection whatever

with the bones of panda-like creatures which had lived earlier in time would involve not just the making of a new kind of thumb, but of the mechanisms involved in its production in the embryo. These too would have to be entirely new. New enzymes, perhaps; new types of chemical reactions unknown to former generations of pandas (or nearly related creatures); in short a wealth of new complexity. And with it new kinds of diseases becoming possible; new possibilities for malformed baby pandas. With every new rearrangement of the parts of pandas in the course of what goes by the name of evolution, the possibilities of disease and malfunctioning would increase apace.

Among the topics Gould discusses is convergent evolution, a striking example being that of the angler fish of which two kinds are known. What a wonderful principle evolution must be to enable a fish, by natural selection, to hang a bait on a line and dangle it in front of its nose so that its meals come almost to its mouth! And not only did this happen once, but it happened yet again with another species of fish. He concludes "If natural selection can do this twice, surely it can do anything". But it is just here that the anti-evolutionist feels that the case goes the other way.

Apart from the possibility of a gene transfer, there are so many much easier things which evolution ought to be able to do, but seems powerless to achieve. Gould cites the case of the turtles which breed on Ascension Island, an island associated with the Midatlantic Ridge. Eighty million years ago America and Africa were near to one another and the green turtle had but a short distance to swim to its breeding ground on a proto-Ascension Island, now long since vanished but replaced (probably) several times over by islands in the same relative positions. (The present Island is less than 7 million years old.) The turtles now have to swim 2000 miles to find the Island, a miracle of navigation, but the dangers of the long journey must be great. Applying the principle of natural selection it would surely follow that some wayward turtles would occasionally find a nearby beach suitable for rearing their young and since the losses in finding such a beach would be much smaller, this beach would soon be established in preference to the far away volcanic island. But no. The evolution which is supposedly capable of doing almost anything, seems unable to accomplish this - surely the simplest of tasks. Gould does not mention the difficulty but the average reader, one might think, would wonder whether in view of contrasts of this kind (of which there are many) natural selection can have much to do with what goes by the name of evolution.

Gould's account of the controversy between Darwin and Wallace is of great interest. Both Darwin and Wallace allowed that all the forms of life might have been built up by natural selection right up to man, situated at the top of the tree of life. But

man was *man*: he was spiritually and intellectually endowed and it proved hard to see how his mind could have arisen in the same way. Darwin claimed that natural selection explains man just as it explains the beast: Wallace thought this quite impossible and said that God or spiritual forces must have intervened.

Many thought that Wallace was adopting a cowardly stance. He had trusted science and reason all the way — till it came to man. Then he defaulted. But brave Darwin carried on!

Gould shows that this interpretation is entirely wrong. With uncanny insight Darwin had said from the start that natural selection is the *main* cause of evolution, not that it is the *only* cause. Wallace had gone further. He had said that it is the *only* cause. He spoke of "those laws of evolution whose essence is, that they lead to a degree of organisation exactly proportional to the wants of each species, never beyond those wants."

Wallace, who had actually lived with primitive races, knew how intelligent they can be. He was one of the few people in the nineteenth century who was not a racist. He pointed out that if a white man behaves badly it is no proof that he cannot do better: it only shows that he does not use the ability he has. And the same applies to blacks. In the case of 'savages' it was clear that only a tiny fraction of their moral capabilities were put into operation. Therefore the moral capabilities cannot have arisen as a result of natural selection, for they can have no selective value unless they are used. So natural selection cannot explain the jump from animal to man. The higher moral faculties must be a creation of God.

Darwin was aghast at such reasoning! Wallace, 'co-discoverer' of the principle of natural selection, had agreed with Darwin's own line of thought right up to very near the bitter end. But now, when man and man's mind entered the discussion, Wallace had become a traitor to the cause. "I hope you have not murdered too completely your own and my child" he wrote to Wallace. Darwin himself took the final steps bravely by bringing man and his mind into the evolutionary picture in his books *The Descent of Man* (1871) and *The Expression of the Emotions* (1872), leaving Wallace to appear as a coward for not following suit.

Wallace was right if natural selection and natural selection only was the cause of evolution, says Gould. No other plausible theory to account for evolution was forthcoming. All of which puts Gould on the defensive again. He falls back on Darwin's claim that natural selection is not the *only* cause of evolution, "Objects designed for definite purposes can as a result of their structural complexity, perform many other tasks as well" (p.57). You can purchase a computer to issue monthly pay cheques, but it can analyse

election results as well. Our noses are designed for breathing and smelling but can also be used to carry spectacles. ...Well... Perhaps. But one has a feeling that this is no honest argument. The computer would not do another job unless programmed so to do — programmed by whom or what? Would a brain naturally selected to help men find food and shelter, be accidentally designed to produce the music of a Beethoven too?

Chapter 10 on the Piltdown hoax is excellent. Most of the other chapters follow fairly well trodden lines. Chapter 10 deals with hominids and chapters 13 and 14 give an interesting historical account of the theory that brain size and intelligence are linked — a theory invented by males which made it easy to prove that females are inferior! Many other controversial issues are discussed in short informative chapters — the theory of the selfish gene, of punctuated equilibrium, of neutral gene mutation and so on. Gould even agrees with Goldschmidt that macroevolution is not microevolution extrapolated. Natural selection, far from taking millions of years to operate, can happen quite suddenly, he thinks, and he reckons (surely very implausibly?) that abrupt change may not be anti-Darwinian (p.188). Preadaptation he believes to be important, indeed essential, but agrees that "a plausible story is not necessarily true" and that in fact it will not always work.

In retrospect the story of how Haeckel tackled the origin of life makes for some amusing, if sad, reading. To account for the transition from the inorganic to the living world Haeckel needed a half way stage, a missing link, and this he found in protoplasm; "An entirely homogeneous and structureless substance, a living particle of albumen, capable of nourishment and reproduction." In deep water he reckoned he had found a jelly or scum of protoplasm and this was to be named after the great Haeckel himself — *Bathybius Haeckelii* it was christened. This scum, said to encircle the earth, proved a great help to those who wished to explain why life had come so late on the scene in the Cambrian explosion. "All participants in the debate accepted without question the obvious truth that the most primitive life would be homogeneous and formless, diffuse and inchoate." (p.240) "The discovery of *Bathybius* proved that life is a property of the molecules of living matter," said Haeckel. Alas for *Bathybius*; it was said to be calcium sulphate precipitated by the addition of alcohol used in the preservation of specimens! But recently (British Association, 1982) it has resurrected again — was it dead organic matter which had settled to the bottom of the sea?

Chapter 29 and 30 are concerned with "Size and Time". Galileo pointed out that the strength of a leg is proportional to the square of its dimensions, but the mass it must carry to the cube. So legs must get thicker as we do up the scale of size in animals. All

of which is true enough, but there is no mention of the difficulty this must cause the evolutionist, for there may come a time when complete redesign becomes necessary (e.g. the insect's eye to the eye of the mammal) and it is hardly possible to suggest how one form could evolve into the other.

This is an enjoyable book, with a wealth of information on a variety of subjects, especially those of interest to the biologist. But it needs to be read critically.

REFERENCE

- 1 Stephen Jay Gould, *The Panda's Thumb*, W.W. Norton & Co., 1980, 343pp., £6.95.

REDC

Reviews

P.C.W. Davies, *The Accidental Universe*, CUP 1982,
PB, £4.95.

The physics of many aspects of our universe, from the scale of the galaxies, to that of the nucleus, has now been investigated in some detail. In this book the Professor of Theoretical Physics at the University of Newcastle-on-Tyne asks whether such widely different, even disparate, entities show signs of a common order or pattern. Or whether the known facts about our universe suggest that it is merely an accident of nature.

Davies concludes that many physical systems can best be understood, at least broadly, in terms of a relatively small number of fundamental universal constants. His basic thesis is that the existence of the universe as we know it relies on a remarkable 'fine-tuning' of these constants, and on a series of 'accidents' concerning the various ratios of these constants. The constants arise out of the four known fundamental forces which are believed to control all physical phenomena: gravity, electromagnetism and the weak and strong nuclear forces.

The scope of the book is to explain the operation of these forces in a number of situations, for example in the neutrino and the nucleus, or in stars and galaxies. Assuming the Big Bang Theory of the creation of the universe, its history is deduced from principles based on the four known forces; similarly a scenario for the likely winding up of the universe is presented (a Big Crunch!) Davies then proceeds to show how small changes in these forces (and their associated constants) would have affected the structure, history and future of the universe. It is claimed that a remarkable set of 'accidents' must have taken place at the beginning of time for our world to exist in its present state and indeed for us to have a place in it. Finally, finding that some "principle seems to be at work, organizing the cosmos in a coherent way" he considers some possible explanations.

Davies's argument is lucid and interesting. Intended as an introduction to the subject for the non-specialist, the discussion is attractively presented with straightforward mathematics. There is a useful bibliography for further reading. A simple description of our present understanding of the fundamental forces

and of nuclear structure provides a valuable introduction to the work.

I found the discussion of the delicate balance of physical properties and of universal constants in our world a very compelling, and the most fascinating part of the book. For example, the neutrino might appear uninteresting since it interacts rather weakly with ordinary matter. However, it is the most abundant particle known, and if its mass were to change from 5×10^{-34} kg to say 5×10^{-35} kg, the gravitational power of the cosmic background would be altered and the expansion rate of the universe (and so presumably its fate) greatly changed. In addition, Davies believes that neutrinos were originally intimately involved in transmutation reactions of protons into neutrons. The relative abundance of these particles is determined by the Boltzmann factor $\exp(-Mc^2/kT)$. These fundamental particles have energies ensuring that the exponent is close to unity i.e. so that the numbers of neutrinos and protons are nearly equal. With the abundances the same, only the reactions of $n+p = D$ and $D+D = {}^4\text{He}$, are likely. But because of an excess of protons, hydrogen must form - and this is essential for organic life.

Many such fascinating examples of 'fine-tuning' are given. Another example is taken from the nucleus where the strong force binds the nucleus together but is opposed by the electric forces between the charges. The relative strengths of the forces dictate which nuclei are radioactive and it is calculated that if the strength of the strong nuclear force was reduced to half its value, elements such as iron and even carbon would be radioactive. Again, in the simplest case, if this balance were wrong the adhesion of proton and neutron to form deuterium would be unlikely. Deuterium reactions form the basis of our sun's energy.

Yet again, the large number 10^{40} appears in apparently unconnected contexts in physics: for example it is the ratio of the electrical/gravitational force between the proton and the electron, while the number of charged particles (N) is 10^{80} or $(10^{40} \times 2)$ etc. Such 'coincidences' point to a cooperation between widely different branches of physics and are indicative of a "basic principle at work".

The sections of the book dealing with the past and future history of the universe are less appealing. The primeval state of the universe is deduced partly from the radiation reaching us after having taken aeons travelling at the speed of light. Because the frequency and intensity of this radiation corresponds to the Planck spectrum, it is claimed that the primeval world was in a state of thermodynamic equilibrium. Davies admits that this can only show events as far back as 10^5 years after the Big Bang, but still proceeds to discuss in some detail the "early epochs" without sufficient justification for his conclusions.

In the final part of the book where an explanation is sought for this amazing catalogue of observations, the argument moves from the scientific to the philosophical and metaphysical. Davies discusses the anthropic principles put forward by earlier authors. The weak principle is summarized by the weak dictum "the world we live in is the world we *live* in"; the strong form asserts that the universe must create observers at some stage. The arguments here are less convincing largely because they have little factual basis.

At least Davies faces up, though, to the logical conclusion that pattern, cosmic order, and remarkable numerical and physical coincidences are observable — that the universe definitely shows design. Many scientists seem unwilling to take this logical step. This is exemplified by the *New Scientist* review of the book (20 Jan. 1983), (contrast the *Nature* review which was highly favourable) where Davies was severely criticized for proposing the anthropic principles. In my view this is an unfair criticism because the author does not lay down a dogmatic position on the issue in the way that he does on the scientific argument. Rather I think that his treatment is fair and level-headed. The *New Scientist* reviewer had little time for Davies' approach wishing to retain his own mechanistic evolutionary dogma at all costs — the universe (quote) is "in no way designed for our convenience".

DR DAVID JOYNER
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Robert Harris and Jeremy Paxman, *A Higher Form of Killing: the Secret Story of Gas and Germ Warfare, Triad/Granada*, 1983 edition, 272 pp., PB, £2.50.

This is a scholarly, well researched, heavily documented work on chemical/biological warfare. The title is taken from Fritz Haber's Lecture when he received the Nobel Prize for chemistry in 1919. It describes the horrible sufferings of the British soldiers at Ypres on 22 April when the Germans opened 6000 cylinders of chlorine and it continues the story up to the present day. Although it was widely claimed that only 3% of casualties in WW1 proved fatal the authors have good reason to believe that this figure is bogus. In addition many who were gassed then and afterwards suffered for the rest of their lives. Later it appears that the British used gas on the North West Frontier and gas has been used repeatedly since. Among other instances of its use the authors cite the disgraceful Italian attack on Abyssinia in 1935-6 when 700 tons of mustard gas were shipped to attack defenceless natives from the air. Stanley Baldwin described this Italian action as a "peril to the world" especially as the Italians were heedless of the Geneva Protocol. At this

time Pope Pius 11th held a High Mass for the departing forces, he and his bishops blessing the soldiers and the ships of war.

Work on the nerve gases Tabun and Sarin was started by the Germans before WW2 and Hitler probably thought of them as his secret weapon. The authors seem unaware of the work that was conducted at Cambridge on compounds of this kind during the war. Dr B.C. Saunders tells the story of how, after a very senior military man expressed scepticism about the effect of these 'gases', he voluntarily entered a room with an exceedingly low concentration of one of them in the air. For a while he was happy enough and went home convinced that they were of no interest to the War Office. But his pupils gradually contracted. When at long last, after boarding a few wrong buses he found the street in which he lived, he went to the wrong house! His furious wife thought he was drunk but the official secrets act made explanation quite impossible!

A Christian reading this book can only thank God for saving Europe from a terrible calamity. At times Churchill was bent on using gas and biological weapons. Anthrax bombs were ready and tested for an attack on Berlin: had they been used the area would still have been uninhabitable today. He had decided that Germany was to be drenched with poison gas and this would certainly have happened if the war had lasted much longer. His attitude was well expressed in his own words: "It is absurd to consider morality on this topic when everybody used it [mustard gas] in the last war without a word of complaint from the moralists or the church. On the other hand the bombing of open cities was regarded as forbidden. Now everybody does it as a matter of course. It is simply a matter of fashion changing as she does between long and short skirts for women." (p.128)

The inhumanity of man to man and beast beggars description. Documents recently released show that Japan used biological warfare against various Chinese cities. The Japanese tested their weapons on Chinese prisoners of war early in the 1940s using anthrax, cholera, plague, hemorrhagic fever, smallpox, typhoid and gas gangrene. The progress of the diseases was studied by killing a few of the subjects with morphine from time to time, autopsies following. At the end of the last war the research material was collected by the USA: it appears that the Americans exchanged this research data, which was found most valuable since it could not be obtained in the USA, for immunity from prosecution. The book draws attention to the deficiencies in the agreements governing the use of chemical and biological weapons - often it is all but impossible to confirm that violations have occurred.

Plans were afoot in WW2 to use anthrax bombs against the Japanese: they were abandoned when the atom bomb was ready.

At Porton in 1952 chimps, goats, dogs and other animals were tethered to stakes and fired at with nerve gas shells which had been captured from the Germans. The man who was sent to collect the dead animals went mad and had spasms for the rest of his life. And so on and on.

"The world missed chemical warfare in the Second World War by inches" (p.135). "The world was spared the horrors of germ warfare and gas warfare not by any noble desire to obey international laws but by a chapter of historical accidents" (p.106) conclude the authors. Accidents? or did God overrule events to save us from the consequences of our sins? How many more chances will he give us?

REDC

Michael A. Eaton, *Ecclesiastes: An Introduction and Commentary*, Tyndale Old Testament Commentaries, IVP, 1983, 159 pp. PB. £3.95, Board, £4.75.

In his preface Michael Eaton describes himself as a former cynic who had "revolted from the world in disillusionment and disgust". While this is a qualification which he values for handling *Ecclesiastes*, it is far from being his only credential. He is impressively well-read in the vast literature on the book; he argues closely and fairly for his renderings of disputed words and phrases; and he is able to relate the parts of this seemingly disjointed book to the thrust of the whole.

Ecclesiastes is seen here as a work of apologetic, designed not merely to expose the hollowness of life lived on the secular plane, but to commend its wholly satisfying alternative. The Preacher "wishes to drive us to see that God is there, that he is good and generous, and that only such an outlook makes life coherent and fulfilling" (p.48).

Mr. Eaton has given us not only a masterly exposition in the Commentary proper, but in the Introduction a very thorough and well documented discussion of matters of text, language, authorship, canonicity, cultural context and varieties of interpretation. There could hardly be a better guide, at this moderate length, to the academic issues and debate, or a sounder and more penetrating verse-by-verse unfolding of the message of the book. Finally in a couple of pages of 'Postscript', in which the point of the Preacher is deftly driven home, we are reminded that what we have been handling is a word for our own times.

It is an outstanding piece of work.

DEREK KIDNER

Eric Chivian, Susanna Chivian, R.J. Lifton and J.E. Mack (eds) *Last Aid*, W.H. Freeman & Co. Oxford, 1983, 338 + xxii pp, PB £7.40; Board £15.80.

Increasingly, groups of professional people are bringing their particular knowledge and skills to bear on the problems of nuclear war. This is encouraging. During recent months we have seen statements by the British Institute of Radiology, the British Medical Association, and now a fuller publication, LAST AID, by International Physicians for the Prevention of Nuclear War (IPPNW). Such responsible presentation of facts can do nothing but good.

International Physicians for the Prevention of Nuclear War came into being because a group of doctors in Boston, USA, in 1980, considering the effects of a single one megaton weapon exploded over their city, concluded that any effective medical response to help the survivors and reduce the number of deaths was an illusion. This stark conclusion was conveyed in a letter to the President of the USA.

The first meeting of this International body was held in March 1981 at Washington, DC. Seventy three delegates from eleven countries, including 13 doctors from the USSR, attended. Two of the leading figures were Dr. Bernard Lown of Boston and Professor Evgenyi Chazov (Mr. Brezhnev's former personal physician) of the USSR.

LAST AID is a full and detailed report of this Congress, in which physicians and medical scientists from both sides of the divide and from many different political backgrounds came together and talked freely about the effects on human beings of the devastating new weapons of war. Starting with general statements by these two leading figures, the book contains chapters on the events at Hiroshima and Nagasaki, two of which are given by Japanese doctors who had experience at the time, and goes on to examine the medical consequences of weapons hundreds or thousands of times more powerful. Four authors examine in turn the effects of a nuclear attack on a typical large city in their own country; Detroit in the USA; London; a city of 1 million inhabitants in the Soviet Union; and Tokyo.

The findings, independently arrived at, all point to the same general conclusion, a picture of total devastation over an area of 20 to 50 square miles in which 500 000 or more would be killed and perhaps an equal number seriously injured, surrounded by an area up to 200 square miles in which flying debris, collapsing buildings, heat flash from the bomb as well as radiation from fall-out would cause casualties to some tens or hundreds of thousands of people. Roads would be blocked, trees torn down, houses destroyed, and more than half the people would be suffering from second or third degree burns.

There follows a Section concerned with the medical response to such a situation. The possible response can only be described as totally inadequate. Doctors are accustomed to working in an environment in which resources and help can be drawn upon as required, and specialised care provided for those needing it, but where hospital and other medical facilities are destroyed, rescue, fire and relief services put out of action, and a great many of the doctors themselves killed or injured, the task falling on the remainder is beyond human capability. It is estimated that for each doctor surviving there might be 1000 or more seriously injured persons each calling for expert and specialised attention.

The conclusion is inescapable that thousands of burned or otherwise gravely injured people would receive no medical care, would have no morphine for relief of pain, no dressings for wounds, no skilled nursing and scarcely any food or water. The picture from all angles is one of utter devastation. It has been rightly said the living would envy the dead.

While much information is given on the medical effects of nuclear weapons, including the short and long term consequences of radiation and the psychological trauma of an overall scene so totally outside our range of comprehension, attention is also given to wider aspects. Nuclear explosions are known to reduce the ozone concentration in the upper atmosphere. This ozone layer protects us from the harmful effects of ultraviolet light, and if greatly depleted the overall consequences to life on earth could be profound. The extent of depletion which might result is not known, but estimates suggest it could be by as much as 50 per cent, and this is marginally near to the level at which major biological effects could occur. Recovery of the layer by interaction of sunlight with the atmosphere is slow and could take 5 to 10 years.

The report leaves us in no doubt about the catastrophic effects of nuclear war. We are reminded of the statement of President Reagan, "A nuclear war cannot be won and must never be fought"; equally of the statement of President Brezhnev, "The peoples should know the truth about the consequences, ruinous for mankind, which nuclear war would bring".

PROF. FRANK T. FARMER

Malcolm Bowden, *Ape-man: Fact or Fallacy?* 2nd enlarged edition, 1981, 257 pp., £3.80 (post free). *The Rise of Evolution Fraud*, foreword by Henry M. Morris, 1983, 227 pp., £3.90 (post free). Sovereign Publications, P.O. Box 88, Bromley, Kent, BR2 9PF.

Malcolm Bowden is that 'rare bird', a creationist who undertakes

original research. This second edition of *Ape-man: Fact or Fallacy* is a 'must' for all students of origins, whether creationist or evolutionist. In this volume the author investigates the skullduggery which has surrounded the search for that critical intermediate - an ape man. His trenchant well-documented criticisms have certainly permeated the field and nowadays, knowing that interpretations of fossil finds are criticised by less than adulatory students, anthropologists have learned to measure claims more carefully than in the past.

Bowden deals with Piltdown. Read his account in conjunction with the series in the *New Scientist* by L. Harrison Matthews FRS, May-June 1981. He also investigates Pekin Man and Java Man. Although Piltdown is an admitted fraud, the other pair still grace most evolutionary trees. Bowden's penetrating analysis points to a small network of influential and prejudiced ape-man 'generators'. Who are they?

After dealing with Neanderthals and *Hesperopithecus haroldcookii* Bowden passes to the 'stardust' which envelops the South African finds of the Leakeys and Johanson. Throughout the whole work the author, with attention to detail, is making his point that man is man and apes are apes. - "Ne'er the twain shall meet". Is he successful? That is for readers to judge.

The Rise of the Evolution Fraud is intended more as a creationist polemic and source book. First Bowden interprets the 'real' motives of Darwin, Wallace, T.H. Huxley, Lyell and others in their works on evolution. He documents the rise of the theory and the way in which the establishment, aided and abetted by the BBC, have stifled opposition.

Clearly, as a fundamentalist, Mr Bowden is concerned about the moral repercussions of Darwinian theory. He has armed his readers with information to help them 'fight the good fight'. I feel that the book is at its best in the detective first half rather than in the somewhat disjointed series of philosophical criticisms and appendices with which it concludes. Nevertheless, whatever one's views, this is an interesting book.

MICHAEL PITMAN
CAMBRIDGE.

N.M.de S. Cameron (ed), *In the Beginning: a Symposium on the Bible and Creation*, Lectures given to the Biblical Creation Society, 51 Cloan Crescent, Bishopbriggs, Glasgow, 1980, 48 pp. £0.70 post free.

J.G. McConville (interpreting Genesis chs. 1 to 11) argues that these chapter must in some sense be historical. R. Macaulay

("Creature and Creator") writes on man in the image of God. D.A. Carson writes sensibly on "Adam in the Epistles of Paul" quoting from modern theologians who, by shuffle and dodge, seek to maintain that Paul did not refer to a literal man named Adam, or that his arguments do not necessarily demand a literal Adam. "The delineation of Pauline theology is not helped" he says "if we discount Paul's arguments whenever they offend modern sensibilities." This paper is very scholarly. E.H. Andrews writes on "Nature and Supernature" draws attention to the biblical passages which refer to nature and to its relationship with the Creator. On the basis of Col.:1:17 and Heb. 1:3 ('hold together' 'upholds') he argues that laws of nature (equated with the "word of His power") must exist. Taken as a whole, despite some good material, I found the booklet rather lacking in interest and sometimes a little ponderous.

REDC

Brother Lawrence, *The Practice of the Presence of God*,
F.M. Blaiklock (trans.), Hodders, 1983, 93 pp., PB, £1.25.

This slim volume contains the conversations, Letters, Ways and Spiritual Principles of Brother Lawrence. The translator has written an informative introduction which sets the words of this 17th century saint in their historical and spiritual context. The book is well worth buying. The glorious simplicity of Brother Lawrence's faith is both refreshing and stimulating. — a worthwhile antidote for theological indigestion!

ROBERT C. WHITE

Donald Webster, *Our Hymn Tunes — their Choice and Performance*, St. Andrew Press, 1983, 251 pp., £7.50.

This claims to be the first book "devoted entirely to the choice and performance of hymns in our churches", and it has much to offer anyone interested in Church music or involved in planning services. It is primarily a book by an organist and choirmaster for other organists and choirmasters, and more than 100 of its 251 pages are taken up with detailed indexes of hymn tunes. But its pithy, readable style and comprehensive approach commend it more widely, in particular to clergy of all denominations who are responsible for choosing hymns week by week for worship.

As Lionel Dakers points out in the Foreword, Hymnody is an essential factor in worship, and the author is in no doubt at all that we do both God and ourselves a disservice by offering anything less than the very best of which we are capable. Hymn singing should, he says be a vital and enriching experience for all the participants, and he deplores its present generally low level.

"Weak music is not just bad art — it is bad theology"; and among the 'earsores' singled out for scathing criticism are the 'Old Rugged Cross' (whose "exaggerated emotion and over-ripe fervour make for intellectual and artistic corruption"); several of Geoffrey Beaumont's tunes ("false accents; cliché-ridden harmony; commonplace to the nth degree"); and most of the 'Pop' music used in churches ("shoddy and not even good of its kind"). Of the tune Trentham, set to 'Breathe on me, Breath of God', he says, 'one might conclude that the breath of God was an anaesthetic, not a giver of life.'

But though provocative, this is by no means a negative book. In a series of chapters ranging from an "analysis of good and bad tunes" to "singing hymns as anthems", the author gives much positive and practical advice. He describes a 'good tune' as one which "wears well and comes to mean more to one as the years progress.., it impresses by its memorability, and the fact that not all its secrets are revealed immediately." Nor is judging good and bad music simply a 'matter of opinion' as some maintain: — he points to certain objective criteria, and declares that true excellence should be discernible by the congregation as well as the trained musician. This belief underlies a series of reviews of existing hymn-books, which is helpful but already incomplete. For example, the controversial 'Hymns for Today's Church' was still no more than a rumour at the time of writing. However, elsewhere he has harsh things to say about 'vandalising' the texts of standard hymns.

This is a timely, stimulating and well presented book. It comes as a welcome reminder that hymn tunes deserve to be taken as seriously as the words if God is really to be glorified in our worship.

JAMES NEWCOME.
RIDLEY HALL, CAMBRIDGE

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Abbreviations. Asterisk (*) - the first page of an article; c - correspondence; d - contribution to a discussion; f - and pages following; r - review; rw - writer of a review.

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