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ABOUT THIS JOURNAL

FAITH AND THOUGHT, the continuation of the JOURNAL OF THE TRANSACTIONS OF THE VICTORIA INSTITUTE OR PHILOSOPHICAL SOCIETY OF GREAT BRITAIN, has been published regularly since the formation of the Society in 1865. The title was changed in 1958 (Vol. 90). FAITH AND THOUGHT is now published three times a year, price per issue £5.00 (post free) and is available from the Society’s Address, 29 Queen Street, London, EC4R 1BH. Back issues are often available. For details of prices apply to the Secretary.

FAITH AND THOUGHT is issued free to FELLOWS, MEMBERS AND ASSOCIATES of the Victoria Institute. Applications for membership should be accompanied by a remittance which will be returned in the event of non-election. (Subscriptions are: FELLOWS £10.00; MEMBERS £8.00; ASSOCIATES, full-time students, below the age of 25 years, full-time or retired clergy or other Christian workers on small incomes £5.00; LIBRARY SUBSCRIBERS £10.00. FELLOWS must be Christians and must be nominated by a FELLOW.) Subscriptions which may be paid by covenant are accepted by Inland Revenue Authorities as an allowable expense against income tax for ministers of religion, teachers of RI, etc. For further details, covenant forms, etc, apply to the Society.

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THE ANNUAL GENERAL MEETING, 1982

The Annual General Meeting of the Institute for 1982 was held in the Hudson Lecture Theatre, Chelsea College, 552 King's Road, London, S.W.10, on Saturday, 22nd May, 1982 at 10 a.m. In the absence of the President, the Chair was taken by Prof. R.L.F. Boyd, Vice-President.

The Minutes of the AGM held on the 16th May, 1981 were adopted.

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

Prof. M.A. Jeeves and Mr. T.J. Chappell, both nominated by Council, were elected as a Vice-President and the Treasurer respectively.

The appointment of Prof. D.C. Burke, coopted by Council since the last AGM to fill a vacancy, was formally ratified.

Mr. D. Mitcheson, Prof. C.A. Russell, and the Rev. Dr. M.J. Collis, 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, 1981, and these were adopted nem. con.

Messrs. Benson, Catt & Co. were re-appointed as Auditors.
Following the withdrawal of the Institute's charitable status by the Charity Commission on technical grounds, Council proposed certain minor amendments to the Constitution which it was believed would permit the restoration of that status. The membership having been given the statutory notice of the amendments, the latter were formally adopted. (The Constitution as amended will be published as soon as possible in the Journal.)

The Chairman of Council gave a brief informal report.

CHAIRMAN'S REPORT

The Chairman first of all expressed the Council's appreciation of those who had so willingly accepted new offices.

Prof. Malcolm Jeeves, of the Psychological Laboratory, the University of St. Andrews, had previously served on Council, but had resigned because of his inability to attend meetings regularly. By accepting the invitation to become a Vice-President he would continue to serve the Institute.

Mr. Tom Chappell, F.C.C.A., shortly to retire from an accountancy appointment in the City of London, had very kindly joined the Institute in order to become its Honorary Treasurer.

Mr. David Burgess, a member of staff of the Hammersmith and West London College of Further Education, and author of a recent paper read to the Institute (Faith and Thought, 1980, 107(3), 167), had undertaken the responsibility of Meetings Secretary.

The Chairman then briefly commented on finance. The excess of income over expenditure reported in the Accounts was not an indication that the Institute was financially healthy, but resulted from a delay in printing the Journal. Had three numbers been issued during the financial year, the extra printing costs would have led to an excess of expenditure over income.

The withdrawal of charitable status meant that the Institute had not been able to recover income tax under covenants — a substantial loss of income. It was hoped that the amendments to the Constitution would rectify this in subsequent years and might possibly permit retrospective recovery of tax.

He reiterated his emphasis in recent AGM's on the importance of recruitment if the Institute is to survive. Increased subscriptions would be counter-productive, whereas increased membership would enable the Institute to extend its activities. A new publicity
leaflet intended for mass distribution had been prepared, and members were urged to use it as widely as possible. Copies were available from the Assistant Secretary. Council had appointed a small committee to investigate the most efficient means of disseminating copies amongst thinking Christians.

The Chairman finally outlined the current policy relating to the use of prize funds. Interest accruing from investments would be applied each year to the award of a prize to the author of the best paper, within a specified field, that had been published in the Journal during the preceding three years, provided that the paper was deemed to be of sufficient merit. The prizes due for award during the next three years were as follows:

1983 Schofield Prize (Psychology)
1984 Gunning Prize (Natural Science)
1985 Langhorne Orchard Prize (Any other field).

The Council was concerned to encourage young writers, and had decided that a certain degree of priority should be given to such authors in the selection of prize-winning essays. Authors who had not attained their thirtieth birthday were therefore invited to state their dates of birth when submitting papers to the Editor.

LORD DENNING, THE MASTER OF THE ROLLS

Lord Denning, who has served the Society as Vice-President since 1974, is now retiring from the office of Master of the Rolls at the age of 83 years, having occupied the position for twenty years.

There is no need for this Journal to add to the many press and professional tributes that have been paid to him for his outstanding qualities as judge in his supremely influential office. His moral convictions and humanitarian concerns emanate from his deep Christian faith, as he has demonstrated in two contributions to the VI. Many of us will remember his fine lecture delivered to the Institute on the subject of "The Influence of Religion on Law", published in FAITH AND THOUGHT, 1963, 93 (1), 3.

We understand that he is still as active as ever, and is looking forward to having more time to participate in debates in the House of Lords, and for gardening and local activities at his home in Hampshire. May we hope that he will find time also to write further contributions to FAITH AND THOUGHT? We wish him and his wife a long and happy retirement. G.E.B.
EDITORIAL

The Society has been presented with bound volumes of the TRANSACTIONS, volumes 72 to 89 and unbound issues of FAITH AND THOUGHT volumes 90 to 108(1). The best offer made for these volumes will procure them. Please write to the Honorary Secretary within two months of receipt of this issue.

In this issue we are publishing the first part of Professor Robert Boyd's paper, "Creation of the Cosmos", given at the recent May meeting of the Institute. The second and final part is due to appear later, together with other papers as available.

NEWS & VIEWS

ORIGIN OF LIFE

Dr. J.H.J. Peet writes:

In response to Hoyle and Wickramasinghe's comments on the improbability of the chance development of life on earth (see this JOURNAL, 1981, 108, 103), Professor H.N.V. Temperley has come up with a model not unrelated to Eigen's hypercycles (New Scientist, 1982, 19 Aug., 505-506). While he dismisses the conventional connection between 'information' and 'loss of entropy' curtly, he also dismisses Hoyle's data. He envisages an amino acid concentration of $10^{20}$ molecules per cm$^3$ on the sea shore of "Pangea." With a collision frequency of $10^8$ s$^{-1}$ and an earth life of $10^{17}$s, about $10^{60}$ amino acid sequences could have been tried out. He proposes that from these a "proto ribosome" would have been formed. This enzyme would act as a "jig" on which successive amino acid chains might grow. It is sufficient, he claims, "for one 'proto ribosome'... to have appeared at one place on the Earth, once during the $10^9$ to $10^{10}$ years." (Emphasis his). Then, "such a complex can churn out vast numbers of protein chains... very rapidly." Ideally, he envisages the chance formation of another "cutter" enzyme which would control the size of the protein chain. He regrets, "for religious reasons", that he does not like the conclusion he has reached.

A full repudiation requires more space (see later, next issue), but some facts may be noted here. As Christians we do not fear
facts, but Temperley has not provided any experimental substantiation and his data are wrong. We would add that, even if intelligent scientists succeed in synthesizing life from inorganic material, it says nothing about the actual origin of life, except, perhaps, that intelligence is required!

The concentration of amino acids claimed is very optimistic — one molar (and he ignores diffusion, which surely would be facilitated by waves on the beach?). A number of calculations have been performed and show that the most optimistic figure would be 0.2 molar (more realistically, $10^{-20}$ molar). And then the acids are unstable to ultraviolet radiation and decompose $10^5$ times as fast as they are formed. If any sugars are present then, at the concentrations he quotes, they will react with the acids. His figure is based on twenty amino acids — in fact, there would be roughly twice that because of chirality. No method of selective degradation of the unwanted isomers has been substantiated. Even then, the laboratory experiments have failed to produce the full range of the 20 acids and have yielded plenty of 'unwanted' material.

As for the polymerisation — what is his mechanism? It just does not occur that easily. And why are his 'jig' and 'cutter' enzymes apparently preserved against rapid hydrolysis? If we are to take the 'prebiotic chemists' seriously, they must come up with more realistic and less speculative material than they have produced so far.

THE MACQUARIE PAPYRUS OF ACTS

A fragment in the collection of unpublished papyri at Macquarie University, Sydney, Australia (P. Macquarie inv. 360), has recently been identified as from Acts 2:30-37 and 2:46-3:2. It is the earliest copy of that passage, and probably the earliest piece of Acts, ever found. The papyrus is a narrow vertical strip, broken at all edges, about 9.3 cm high and 1.4 cm wide (a little over $3\frac{1}{2} \times \frac{1}{2}$ inches), written on both sides of what must have been the large page of a codex, probably containing at least the whole book of Acts, in a neat, but informal and sometimes careless, hand. Only three or four letters are preserved complete on each line of writing, but there are legible letters on thirteen successive lines on the front and eleven lines on the reverse, an ample base to put the identification beyond dispute.

The Ancient History Documentary Research Centre at Macquarie acquired this scrap in 1981. It was identified by Mr. Stuart R. Pickering, who is working on the publication of papyri in the university collection and on its projected Corpus of Christian
papyri. This text was readily recognised as Christian by the overlined abbreviation XPN (Ch-r-n) for Christon and traces also of similar abbreviations for 'Father' and 'Jesus'. Alerted to the prospect of a Christian text, and finding the distinctive letter-group s-ph-a in the line above Christon he succeeded in locating the word asphalos ('assuredly') in Acts 2:36. The letters of the other lines on both sides of the sheet then fell into place.

Authorities in Britain and Germany have concurred with Pickering's dating as close to AD 200. The find has now been officially registered as 'P91' by Professor Kurt Aland, Director of the Institut für Neutestamentliche Textforschung at Münster, West Germany.

The textual variants of Acts are of exceptional importance, as the so-called 'Western' text, represented by the famous 5th-6th cent. Codex Bezae ('D') at Cambridge, includes many additions and expansions in Acts whose value has long been debated. This tiny sample shows three identifiable variants, but all are insignificant, a phonetic spelling, a wrongly written verb-form, and the dittography (erroneous repetition) of a syllable. It is not possible to be sure about the exact length and lay-out of the lines where they have to be restored, but one line at 2:36 looks abnormally short, and there the lost portion may have had a textual addition, or an unexplained gap, or perhaps an erasure. We cannot tell. We can only point to the three trivial careless slips. P91 is important for its likely date, not for any textual novelty. If anything, it is a slight confirmation of the continuity of textual tradition without throwing any light on the 'Western' text issue.

I am much indebted to Dr. B.F. Harris, Associate Professor of History and Head of the School of History, Philosophy and Politics at Macquarie, for further information in addition to the notice (with facsimiles and restorations) which he has presented to Tyndale Library, Cambridge (New Testament Papyrus 91. The Macquarie Fragment of the Acts of the Apostles, 4 pp.).

COLIN J. REMER

INVENTION IN NATURE

That man's inventions often follow what has been invented long before in nature (but not, surely, by nature!) is now common knowledge. But sometimes the inventions and discoveries which have enabled man to build his civilisations are seemingly so far removed from nature, that it comes almost as a shock to learn that nature got there first.

We have long known that powerful oxidants, such as chlorine, hypchlorite (sold as 'bleach' in the stores) and hydrogen peroxide,
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(to which modern chemists have added hydroxyl radicals and superoxides) are powerful disinfectants. These materials are themselves destroyed so rapidly in the presence of organic matter that it must have come as a surprise, a good many years back, when it was discovered that hydrogen peroxide often has a part to play in nature and that a special enzyme (found, for example, in horse radish root) is designed to destroy it.

Later it was found that the same chemical tools are made use of by special phagocytes, cells designed to destroy invading organisms. The latest development concerns the discovery that the same method is used by certain large lymphocytes, identified by the fact that inside them, floating suspended in their cytoplasm, there is a single large granule. Until recently the function of this peculiar type of cell was unknown, but it now transpires that the cell is a natural killer (NK) with the extraordinary power of recognising and killing certain virus and parasite infected cells. The cell functions as a NK by manufacturing the killer oxygen molecules mentioned above — making use of essentially the disinfectants that we so often use in everyday life. (J.C. Roder et al, *Nature*, 298, 511, 569).

The light pipe is another development of technology, much in the news. Light will travel along a glass fibre, provided the angle at which it strikes the sides of the fibre is sufficiently glancing. The fibre may be bent to some extent, provided as before that the angle is not changed more than by a critical amount. Light pipes are used in hospitals for viewing the insides of the intestine, blood vessels etc. and are being used increasingly instead of copper wire for the transmission of messages. It has now been discovered that new shoots in plants make use of the same principle. It appears that a sensitive part of a plant shoot, when still below ground, is illuminated in this way. Although plant stems contain irregularly shaped cells which tend to scatter light, they contain also individual columns of long cells which act as light pipes. (Proc. Nat. Academy Sciences, 1982, 79, 2902).

Another example, in this case nature pointing the way, is provided by the chemistry of cement — which consists basically of silica bonded by oxides of metals. Cement is in many ways an unsatisfactory material for the builder and engineer for, though it will withstand great compression, it is weak when subjected to tension. For five years ICI chemists have been trying to discover why it is so weak and to invent a form which can be subjected to tension.

According to accepted views, the strength of cement can only be increased by imbedding within it steel or fibre. But Derek Burchall, leader of the group, reflected on the strength of natural silica-built materials, such as mother-of-pearl and the shells of snails. Imitating nature the group has invented an inexpensive cement
(Lithoplastic) of great strength, suitable, in many cases, as a substitute for more expensive plastics and metals. The New Scientist article (5 Aug. 1982, p.365) has an illustration of a spring made of Lithoplastic!

PLUTONIUM AND THE GENERATION OF ELECTRICITY

Many Christians are much concerned about the rights and wrongs of the way electricity is to be generated in the future. So conflicting is the evidence and so difficult is it to obtain reliable information, that it is exceedingly difficult to reach an unbiased view. In what follows we attempt to collect some of the points of view which have been expressed over the past year or two. (The help of Professor F.T. Farmer is gratefully acknowledged.) The insistence of the British Government on the construction of at least one PWR (pressured water reactor) despite the admitted fact that atomic energy will supply only 3½% of the national need for electricity by the turn of the century, is a cause for disquiet. Lord Bowden claims that on all accounts the Canadian CANDU reactor which uses heavy water is a more reliable and efficient generator of electricity. Why then the PWR? Bowden suggests that efficient electricity generation may be a secondary issue: he wonders if the PWR is preferred because it is a more efficient producer of weapon grade plutonium (the media, 1981).

Sir Martin Ryle, (Towards the Nuclear Holocaust, 1980, The Menard Press, 23 Fitzwarren Gardens, London N19 3TR, £1.50) claims that the propaganda now being put out by the Government in favour of the PWRs is nothing short of deceitful. The claim that PWRs cost only 3% more than conventional stations of the same capacity is grossly misleading he says: at a conservative estimate they must cost at least three times as much. The claim that they are less hazardous to human health than coal fired stations is also open to question. (Coal mining accidents are included in the figures for coal fired stations; uranium mining dangers are not included in the figures for PWRs. However it ought to be added that uranium mining is mainly if not wholly open cast, that radioactivity causes few health problems and that most of the accidents are of a physical nature. See B. Wade, Nature, 19 Aug. 1982, 298, 702).

The claim that in running costs PWRs produce electricity more cheaply than coal or oil fired stations seems also to be in doubt. Ryle tells us that the government buys weapons grade plutonium produced by the power stations at an unknown price, probably several million pounds per kilogram: is the figure adjusted to make it appear that the electricity is inexpensive? With a new generation of nuclear weaponry on the horizon, plutonium is in very short
supply. From what little information is available (and it is very little for there is no democratic control of the electricity industry) it is suspected that the sale of the plutonium to the government may be valued at something like ten times that of the sale of the electricity produced. The Electricity Board (CEBG) deny that they supply plutonium to the Government (New Scientist, 6 May 1982, p.335) but in France generating stations make no secret of supplying the military (J-P.Pharabad, New Scientist, 24 June 1982).

Ryle goes on to say that even the argument that neutron bombs are the only effective way to stop an onslaught of Russian tanks into Europe is fallacious. Tanks, like aircraft, "are now extremely vulnerable to the small, cheap and devastatingly accurate TNT-armed missiles which have been developed during the last 10-15 years" and are now a defensive weapon only. (p.9) (One might think that boron containing steel, or a boron containing cladding, would offer considerable protection to the occupants of tanks were neutron bombs to be used.) The armament situation is fraught with extreme danger, especially for Britain and Europe: America and Russia, with their vast land surfaces and relatively low populations might well survive a nuclear war. The lack of reliable information and of democratic control of what has been agreed with America is alarming.

In a letter to the Times (17 Sept 1981) Ryle argues that the energy investment in a North Sea gas pipeline, turned down on financial grounds, would be between eight and twelve times more cost effective than a new atomic power station. Has the latter been chosen in preference because gas does not produce plutonium?

Another point concerns the danger of possessing nuclear power stations in time of war. A conventional bomb on such a power station might spread radioactive products disastrously. The waste products after the fuel rods have been removed from a reactor are stored above ground in tanks: the bombing of such a locality, or even an accidental air crash, might well be catastrophic. The danger of accidents at power stations was high lighted by the accident to one of the reactors at Three Mile Island in Pennsylvania. This resulted in the use of an unusually large number of sleeping pills by the inhabitants of the immediately surrounding countryside. The US Court of Appeals ruled that electricity must not be generated by the remaining undamaged reactor until Metropolitan Edison, the owner, can prove that the mental health of the locals will not suffer as a result. (Nature, 295, 179) Meanwhile the clean up has already taken two years and cost 270 million dollars. It is expected that the work will take at least another three years. (New Scientist, 29 July 1982 p.285)

It has become fashionable to compare the small number of deaths resulting in the nuclear power industry with the larger number in the coal industry, or the catastrophes caused by the failure of
R.J. Yaes (*Nature*, 297, 622) points out that there have been several near misses and as reactors get old the possibility of accident increases. He reminds us of the legendary story of the man who jumped off the Empire State Building and was heard to shout as he passed each floor, "So far, so good." Despite the rarity of accidents "nuclear power reactors are the only form of civilian technology with the potential to kill several million people in a single accident."

The production of plutonium by power stations is fraught with danger. International Inspection of nuclear fuel is virtually impossible. Inspectors cannot be taught the numerous non-European languages and so cannot question technicians effectively, they are not permitted to inspect wastes from which plutonium might be extracted, they have little opportunity to check shipments, cameras set up to monitor sensitive areas can be interfered with, and so on. In short, track can only be kept on nuclear materials that are openly declared. These statements are made by Emmanuel Morgan, a former inspector of the IAEA (International Atomic Energy Authority) which is supposed to ensure that signatories to the 1968 Nuclear Non-proliferation Treaty abide by its covenants. (*New Scientist*, 26 Nov 1981, p.584).

There are a good many moderately stable isotopes of plutonium, but only Pu-139 is suitable for bomb making. If the fuel rods are left in reactors for any length of time, the yield of Pu-139 is diminished and that of the non-weapons grades increased. About 70 tons of mixed Pu isotopes, not suitable for weapons, is now available in USA and hitherto the possibility of separating weapons grade Pu from the other isotopes has not been envisaged. However, separation is now possible using tunable lasers which excite the Pu-139 atoms only in a mixture and activate them so that they will undergo chemical reactions. The product of the reaction can then be removed quite easily. The equipment can be constructed in small units, more being added as required. Thus the huge cost of a diffusion isotope separation plant can be avoided and much of the waste Pu available used for making nuclear weapons. (*BBC, "Science Now", Radio 4, 21 Dec. 1981). Plans are also well advanced for enriching natural uranium by the laser technique (*New Scientist*, 27 May 1982, p.554).

Despite all the dangers and arguments used against atomic energy, much can be said in its favour. In fact accidents are rare, and those that involve death much rarer still. (Contrast coal mining, accidents in winning oil in the North Sea etc.). It is also urged that by increasing the use of fossil fuels throughout the world in the years to come, the CO$_2$ level in the atmosphere will soar upwards, perhaps affecting the world's climate disastrously. A strong case can also be made for the use of atomic energy in the Third World.
For Pakistan, argues Z. Sardar (New Scientist 12 Feb. 1981, p.402-404) and many other developing countries the use of "nuclear power is simply a matter of survival." Even if all the rivers of Pakistan could be harnessed for electrical generation only 30% of the requirements of the country could be obtained. The hydro power available is far from where it is needed and the dams which would be necessary are all in seismic regions. There is no coal or oil available in the country: already the cost of importing oil covers 60% of exchange earnings. The use of wood for fuel causes erosion. Such arguments seem convincing enough. Unfortunately Pakistan, like other developing countries, is also interested in nuclear bombs (see for example, New Scientist, 23 July 1981, p.203).

In conclusion it would seem that, but for the wickedness of man in misusing God's gifts, we might all agree that atomic energy is often desirable. But as things are decision is difficult.

CARBYNE AND DUST IN SPACE

On paper it is easy to draw a chain of carbon atoms, each linked on one side with a triple and on the other with a single bond to adjacent carbon atoms. Every chemist knows that such a structure must take the form of a straight stick and that its entropy will be low because in the turmoil of thermal agitation molecules are more stable if they are free to wriggle around in ever changing snake-like conformations. One would expect, therefore, that molecules containing chains of carbon atoms arranged in the way mentioned would be unstable and that they could hardly exist at all if the straight parts became too long. In fact compounds containing such straight portions (up to six or eight carbons long) have been known for many years and are found in plants. But when they are isolated they immediately explode. Hardly a cause for surprise! Even acetylene is explosive!

Some years back astronomers started to explain some of the absorption spectra of stars in terms of these structures. It was even supposed that little sticks of this variety of carbon float around in space, perhaps with cyano (CN) groups attached. With due imagination it seemed possible that such molecules were the precursors of life.

In due course (1967) a new form of carbon was suggested — to be called carbyne. Because triple bonds are so reactive (and therefore tempting to a biogenesists) it was just what people wanted to believe and very soon two forms of carbyne, alpha and beta, were postulated and the crystals of the new carbon were said to be hexagonal.
Grains of the new form of carbon was 'discovered' in meteorites and in a mineral called chaotie. Confidence that interstellar dust clouds of carbyne float around in space grew apace, though not all astronomers were convinced. All this work on carbyne continued for some 15 years.

But many chemists, geologists and astronomers had their doubts. At last in 1981 two workers at the Arizona State University (Science, 216, 984) pricked the bubble. They showed that some of the tiny grains of alleged carbyne in the mineral chaoite are only poorly ordered graphite, the rest a silicate clay. The so-called carbyne in meteorites, in so far as it differed from graphite, "could be explained by the presence of minor quantities of sheet silicates together with quartz." Soon all the evidence for carbyne crumbled away. A saga like that of the ill-famed polywater of a few years back — or so it seems! (New Scientist, 24 June 1982, p.846).

Returning to the clouds of dust in space, it is generally believed that these consist of silicates, like the rocks, with carbon grains and perhaps some ice and/or combined water also present. Carbon gives a strong extinction (absorption) band in the infra-red at 220mm and it is claimed that a mixture of silicate and metal oxides with carbon gives a near perfect fit with the curve observed by the astronomers. On the other hand Hoyle and Wickramasinghe claim an equally good fit with microbes (carbohydrates etc.) and carbon. "We cannot conclude that there is any definite proof that interstellar dust is basically inorganic — small grains of silicates and graphite — but many independent lines of evidence point that way" conclude D. Whittet and N. Henbest (New Scientist, 28 Jan 1982, 240-3).

Radioastronomers have claimed to find polyynes (polymers of acetylene) and cyanopolyynes outside certain cool stars, the largest with up to 11 carbon atoms in a chain (Nature, 295, 389). Be this as it may, organic matter can hardly be common in space or some would have been attracted to the surfaces of moons and planets. Examination of two sites on Mars using Viking gas chromatographs revealed no organic molecules above the parts per billion level. Studies of reflectance in the UV and IR spectra over the whole planet again gave negative results. (Nature, 295, 43) Even methane proved undetectable.

D. Whittet and N. Henbest ("Dust in Space — Microbes or Minerals", New Scientist 28 Jan, 1982, 240-243) have surveyed the field. It is too easy, they say, to fit absorption spectra into what ever one feels to be the nature of the dust in space. Though there is certainly some evidence for organic materials in certain regions of the sky, most of the evidence still fits the view that the bulk of the dust consists of silicates or silicates and free carbon.
Interest in this subject has been heightened by Hoyle's theory that, because time, space and amount of matter are far too limited on earth for the chance formation of early living cells or organisms, these may have originated in space. With Wickramsinghe he advanced the theory that disease germs also come from space - a revival of a doctrine advanced long ago by Paracelsus.

FEAR

Fear is dominating our world increasingly, as Jesus said it would. Quite apart from the fear of atomic war and of accidents at nuclear power stations, the widespread dissemination of scientific news generates fears of new kinds. All kinds of quite common foods are now claimed to be cancer producing. Even the knowledge that meteorites and asteroids exist may generate fear among simple people. Recently Kampala was swept by the rumour that a huge meteorite was due to crash in Uganda on Jan 16 1982 killing three million people. Radio Uganda implored people not to heed the rumour: people were assured that meteorites burn up in the sky and cause no damage and that, in any case, there was no evidence that such an object was on the way. Nevertheless many Ugandans fled from Kampala to their tribal areas. (Times, 15 Jan 1982). Rumours of this kind are of course easily started by those who profess to have contact with the spirit world, with which one cannot argue! As occult 'sciences' increase, we may expect such rumours of future calamities to increase also.

The toy manufacturers have produced a novelty in the form of a game in which children try to defuse one another's bombs. "A soldier creeps up to an unexploded bomb. Watching children giggle and clap". The game, called Bombshell is described as hilarious and was sold in the stores as a suitable Christmas gift. (Times, 20 Nov 1981).

Fear is also being created by raising alarms about numerous quite ordinary chemicals which are alleged to cause cancer, or prove dangerous in other ways. According to Glasgow's Herald for Monday 13 April, 1981, "Police warned last night that a quantity of sodium chloride (sic) a dangerous weedkiller, was among items stolen from a shed broken into in Gourdie Street, Dundee" Well! Well!

THE ETHER OF SPACE

Victorian scientists came to the conclusion that space is or at least contains a mysterious substance called ether (or aether),
strains in which show themselves as electric and magnetic fields — light being a transmission of both electric and magnetic fields. All kinds of physical models of the ether were proposed but every attempt to find a satisfactory physical model failed at some point. With the coming of Einstein's theory of relativity ether was discredited. However, in modern theory a vacuum is not 'nothing' but a place in which fluctuating magnetic and electric fields really exist, and where phantom particles come and go in unpredictable manner. Much experimental evidence supports the new picture and many physicists believe that if we could observe empty space to a resolution of $10^{-33}$ cm "it would resemble a boiling, frothy foam, seething under the impact of quantum fluctuations." Clerk-Maxwell suggested, though with characteristic reticence, that perhaps the Creator's first act was to create the ether of space. He and his contemporaries would surely "have been gratified to learn that in its modern quantum form, the ether has materialised at last".


A BEE OR NOT A BEE?

The story of how Sampson killed a lion and later found bees in its carcase (Jud. 14) has long been a puzzle. In his interesting book The Oxen-Born Bees of the Ancients, (Heidelberg, 1894) C.R. Osten-Sacken suggested that the carcase of a part at least of the lion had been completed cleaned out and that bees had later taken up their abode there. It has recently been reported that a species of "vulture bees" has been discovered in Latin America and that these collect dead flesh instead of honey from flowers (New Scientist, 19 Aug 1982). The bees are widespread from the Amazon basin to Panama and feed on any dead animals, reducing them to skeletons within hours. They use the flesh to produce a rich protein food, richer than "royal jelly". Could such bees have existed in the Levant in Sampson's day? Could the food they produce have been confused with ordinary honey by Sampson?

We are told in the New Scientist article that the sight of bees hovering around dead animals and fish is common, but that scientists had not connected it with the collection of food. The legend of the oxen-born bees suggests that such bees may well exist, or have existed, other than in the New World. It is also certain, however, that the ancients often confused the drone fly (Eristalis tenax) with the honey-bee. ("A bee or not a bee, that is the question" see Nature 1894, Ap 12, p.555).
**SHORT NOTES**

**Alternative to War.** In a letter to *Nature* E.G. Dimond of the University of Missouri, Kansas City, reminds us that the modern world seems to have overlooked a method for lowering the probability of war which has been in common use over thousands of years — the method of diplomacy through romance. It was once common for kings and rulers to marry their daughters into the families of their potential enemies. Why not negotiate an International Peace Army, of Russians and Americans, unmarried and between 20 and 25, say quarter of a million of each, who spend September to June each academic year in the universities of the other side, then follow it up with a tour of each other’s country? In each group there would be an agreed proportion of the close relatives of each nation’s high up politicians, generals and VIPs generally, while assurances would be given that the peace armies should return to their own countries after their spell of duty. In countries where there is conscription, the call up of the armies would cost nothing. The hearts of the most determined advocates of nuclear deterrence would surely be softened by the knowledge that a son, daughter, or other close relative would suffer in the event of war. Romances, bound to follow, would further reduce international tensions.

**Optical Activity in Nature.** Do meteorites ever contain optically active amino acids suggestive of extraterrestrial life?

The question has been debated for a century and a half. At first museum specimens were studied, but no one knew if the loving curators had polluted them inadvertently. Then in 1969 on 8 Feb a shower of stones dropped from the sky in Mexico. Within hours some pieces of this, the Allende meteorite, had been safely stored in containers to prevent contamination. Even so biological materials, hydrocarbons and fats were present at the surface — picked up perhaps during passage through the air or from the ground on which they lay. But the interiors were free of such materials and showed no optical activity. In the same year the Murchison meteorite fell in Australia. Amino acids were present but were optically inactive, and so unconnected with life (Kvenvolden et al. *Nature*, 1970, 228, 923) Now, after quite a long time, the meteorites have been examined again. This time Engel and Nagy claim to find an excess of a few L-amino acids. This time the distribution of acids was not of the kind one would expect from contamination by meddlesome human fingers. But the results are very puzzling. (*Nature*, 296, 802, 837). Is there a source of optical activity independent of life? What can it be?
Mortality Rates in Third World. According to WHO (World Health Organisation) the mortality rates in many Third World countries are no longer declining — in some cases they are rising. In African countries around the Sahara where mortality rates are the highest in the world, health conditions have deteriorated over the past decade. In many countries half the deaths are those of young children and although there has been a general improvement over the past few decades, the rate of improvement is falling off badly and in Latin America there are several areas in which mortality rates for children have increased. In developing countries health services reach those who can afford them, but the poorest sections of the community benefit little. Drugs, if available, are of little assistance where there is dire poverty and malnutrition. (New Scientist, 30 Oct 1980, p.275)

Abortion. Some Christians (e.g. RCs and the World-wide Church of God, to take opposite extremes) think of abortion in terms of murder. Peter Cousins (e.g. in The Harvester, May 1981, p.12) usefully points out that in the OT (Ex. 21:12f, 22f; Deut. 19:4f) the accidental killing of a foetus and of a person are not treated on a par. From this it would seem to follow that the deliberate killing of a foetus and of a person are not on a part either, so that, however undesirable or wrong abortion may be thought to be, it cannot be equated with murder.

Relics of the Big Bang? The interesting question now being asked is whether there may be a gravitational wave background analogous to the thermal $3^0 \text{K}$ of photons dating from the beginning of the universe. It is expected that if such a background of gravitons exists, it will have a temperature of $1^0 \text{K}$ at the present time. Gravity waves are so difficult to detect that, at present, it is hard to see how the existence of such a background could be discovered. (B.J. Carr in Nature, 297, 623)

Israel and USA. The helplessness of governments to do what is right has been very obvious in connection with Israel's recent attack on Beirut. The Israeli forces were dependent, largely, on American supplies. In return the Pentagon received detailed information from Israel of the performance of USA made weapons, some of which had never been used in combat before. Some 15,000 American firms are involved and Mr. Begin claims that the Israelis themselves have invented and developed a weapon by means of which they were quickly able to destroy 23 Soviet missile batteries, which included the latest type, without the loss of a single Israeli aircraft. "One day we shall share our invention, especially with our American friends. When we do it will change the whole balance of strength between the Warsaw
pact and Nato forces" says Mr. Begin. Meanwhile weapons of the utmost cruelty were used against the Lebanese — little children with faces badly burned with phosphorus were shown on TV.

Anthropomorphism. "It is clearly impossible for the biologist to renounce anthropomorphism. Implausible as it may sometimes appear, most scientific work is being performed with the aid of the brain; and that brain is necessarily human. That means that science cannot but be anthropomorphic, anthropocentric, etc." Erwin Chargaff in New Scientist, 5 Aug 1982, p.378.

Fireballs at Cambridge. (See this JOURNAL 99, 8) The idea that stones can fall from heaven was long considered to be a superstition until a shower of meteorites fell near Paris and the fall was witnessed by academics at the Sorbonne. The recent fireball at the Cavendish laboratory Cambridge on 3 Aug 1982 reminds us of the earlier saga. Many have supposed that fireballs are an after-image effect caused by the brilliance of the light of a lightning flash. During the violent storm at Cambridge at least two fireballs were formed after lightning struck the centre of the Bragg building. One of them was seen by Dr. Joffe who did not himself see the initial flash, so no question of an after-image arises. The energy associated with the balls was not high as no damage was caused, even by the ball which entered one of the rooms of the laboratory. There is still no satisfactory theory as to the nature of ball lightning but, since the balls persist for a few seconds before disappearing, Sir Brian Pippard thinks that a chemical effect in ionised gases may be responsible. An account of the incident was published in Nature (298, 702) and Sir Brian commented on the subject on Radio 4 ("Science Today"). See also Times, 23 Aug. We have commented before (this JOURNAL, 72, 156) on the fallacy of denying human testimony on the grounds that purported events cannot be explained.

Argentina. Although a signatory to the Antarctic Treaty which limits bases established on the continent of Antartica to civil and scientific work, the Argentinian bases are now manned by the military and are doing very little science. "In recent years the Argentinian government has even gone to the lengths of shipping pregnant women to its bases to have children in Antartica just to support its claim on territory"! (Richard Fifield, New Scientist, 27 May 1982)

Doubts on Evolution. Bernard Dixon, till recently Editor of New Scientist recently reviewed Loren Eisley's All the Strange Hours (Wildwood House, 1980, 273 pp. £6.95). He commends it as an erudite, wide-ranging and beautifully written book — which it most certainly
is. He is especially impressed by reading of Eiseley's dilemma in confronting the marvels of nature. "None has expressed so well the tension between accepting intellectually the edifice of evolutionary ideas that is supposed to account for them, yet emotionally being utterly unable to accept that same meticulously mechanistic body of theory" (New Scientist, 10 Ap 1980).

Henry Moule. (1801-1880). 1980 was the centenary of the death of Henry Moule, a fervent Simeonite (see this JOURNAL, 104, 252) evangelical and one time vicar of Fordington, Dorchester where he laboured from 1829 onwards. At first conditions in his parish were appalling: there were cholera outbreaks in 1848 and 1854 and sanitation was virtually non-existent. Moule started several business enterprises and invented a sanitary closet which made use of dried earth, which was used later on the land. The closet was manufactured in large numbers by several companies and was still in use in places up to the 1930s. An updated version is being advocated for use in developing countries where lack of water makes the usual European system impracticable (New Scientist, 7 Aug 1980; BBC Radio 4, 3 Sept 1982).

Russian Religious Discoveries. The atheist rulers of Russia must have been quite pleased with some of the discoveries lately made behind their iron curtain. Their forensic experts have been examining the bones of some of the Russian canonized saints, preserved near Moscow, and famous for effecting cures of all manner of ailments. But the 'saints' were not Christians at all, we learn, but Mongol invaders against whom the very saints were supposed to have protected the Russian cities. (Proofs to be housed in a new museum of atheism Times, 15 July 1981) After it was noticed that some German altar boys were showing signs of addiction, two scientists at the East German Academy of Sciences's toxicological research station made a study of the products formed in the burning of olibanum (the gum traditionally used as incense). In a journal published in Zurich they claim to have detected tetrahydrocannabinols, the active principle in hashish. It is said that incense long antedates Christian times and was traditionally used to revive the dead and chase away demons. (Times, 9 Jan 1982)
"In the beginning", long before all worlds
Or flaming stars or whirling galaxies,
Before that first "big bang", if such it was,
Or earlier contraction, back and back
Beyond all time or co-related space
And all that is and all that ever was
And all that yet will be; Source of the whole,
"In the beginning was the Word" of God.

Faith and Thought, 1975, 102, 182

How Big is Space?

When Abraham looked up at the stars as he heard God's promise about the multitude of his descendants, he could probably see a couple of thousand points of light. If he had waited the year through he might have picked out six thousand unless for some reason his eyesight was different from ours today. For three millennia the 7mm diameter iris of the human eye remained the only aperture through which the information laden rays of light from the Cosmos reached man's consciousness and invited his interpretation. During much of this time, under the influence of Aristotelian thinking, the "fixed" stars, as distinct from the planetary wanderers were thought of as embedded in a "Caelestiall Orbe" or crystal heavenly sphere and so they were all thought to be at pretty much the same distance from the Earth.

With the invention of the telescope (Galileo 1609, Newton 1670), the prototypes of the huge optical telescopes of this century were born and the numbers of stars perceived increased in a way that has given a special meaning to the adjective "astronomical". Today, although we cannot see them all because of obscuring interstellar dust clouds or because some are intrinsically too faint, we know that our galaxy contains some $10^{11}$. I speak of our galaxy. Not so long ago it was called our Universe and thought of as the whole, though of course no-one knew how far it might extend. It was Thomas Digges who suggested in the century before Galileo that perhaps the stars should be thought of as distributed throughout space. But his idea taken with the ever increasing number of stars seen with bigger and bigger telescopes gave rise to a famous paradox ascribed to Olber
Olber pointed out in effect that given a large enough Universe of perfect transparency, any line of sight must terminate on a star and so the sky would be seen bright all over as the surface of an average star. Not only would this mean that the sky would not be dark at night, it would imply an intolerable and obviously unreal illumination of our Earth.

Olber's paradox was resolved just a century later by the work of Hubble who made two important and very relevant discoveries as a result of some careful observations. He was studying with the giant 100 inch telescope at Mount Wilson certain fuzzy patches of light called 'nebulae' (from a Latin word meaning 'mist') which were thought to be components of our galaxy. This was natural enough as no-one knew of anything else. These patches, of which the nebula in the constellation of Andromeda is perhaps the best known, being just visible to the unaided eye, were shown by Hubble to have distances far greater than the most distant stars in our galaxy. It is not surprising that for a while they were popularly known as 'other' or 'island universes' though it is probably best to keep the word 'Universe' for 'the whole'. This gives it much the same meaning as 'Cosmos' though the latter has classical overtones of order as distinct from disorder (chaos).

Throughout the Universe, galaxies are distributed with a profusion matching that of the stars in our own galaxy. Typically, a galaxy contains ten thousand million stars though ours has perhaps ten times more, and the number of galaxies in our 'visible universe' is of the same order.

The mention of 'visible universe' introduces the second of Hubble's great discoveries. These distant galaxies are moving away from us. What is more, they are moving away with speeds increasing on the average with their distance from us. It is in fact this that is the real solution to Olber's paradox. The mere recognition that our galaxy is finite brings short lived relief from the paradox, for we soon realize that the same argument could be applied to the galaxies themselves so that everywhere we looked we would see a galaxy and although the more distant ones would appear fainter this would be exactly balanced by our seeing more in each square degree of sky. There are only three possibilities apparent. Either space is not transparent — we have good reasons for knowing that while that is true of certain localities it is an inadequate explanation of the paradox — or the Universe may be finite; this may well be the case but we cannot be sure. The reason we cannot be sure is Hubble's great discovery of the recession of the galaxies, but this itself brings a resolution of the paradox. The Doppler effect is a familiar phenomenon. For light as for sound if the distance between an observer and a source is decreasing rapidly the frequency is increased, the light appears blue-er. If the distance is increasing,
the shift is to the red. Distant galaxies appear reddened and the most distant ones which are receding at velocities approaching the speed of light are so reddened that they seem (but only seem) relatively dull and cool. Thus the paradox is removed. There is a distance at which any galaxy would be moving away at the velocity of light. This sets an absolute limit to the boundary of the 'visible universe'. So much then for the extent of the 'visible universe'. It is incomparably greater than earlier ages supposed and it is of finite size though we cannot exclude the possibility that it might be changing in size. We must remember that we cannot actually see as far as it stretches, for the technical reason that the energy from any object at its limit would be red-shifted to become infinitesimal. In practice, of course, we can only see part of the way, about half, though we are slowly increasing that fraction. We have to remember that 'visible' in this context means 'in principle visible' if we had infinitely powerful telescopes.

We will set down some numbers to help us to get some sort of feel for the magnitudes we are thinking about. We will use the popular unit 'light year' — the distance travelled by a pulse of light in space in a year — rather than the parsec which because it is more directly related to observable quantities is usually used by astronomers. A parsec is in fact 3.26 light years and a light year is just less than $10^{13}$ kilometres ($5.91 \times 10^{12}$ miles).

**Some Numbers, Distances and Times**

(orders of magnitude)

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of atoms in an insect</td>
<td>$10^{22}$</td>
</tr>
<tr>
<td>Number of stars in our Galaxy</td>
<td>$10^{11}$</td>
</tr>
<tr>
<td>Number of galaxies in 'visible universe'</td>
<td>$10^{10}$</td>
</tr>
<tr>
<td>Diameter of the disc of our Galaxy</td>
<td>$10^5$ light years</td>
</tr>
<tr>
<td>Distance to Sun</td>
<td>8 light minutes</td>
</tr>
<tr>
<td>Distance to nearest star ($\alpha$ - Centauri)</td>
<td>$10^8$ miles</td>
</tr>
<tr>
<td>Diameter of the 'visible universe'</td>
<td>4 light years</td>
</tr>
<tr>
<td>Total number of stars</td>
<td>$10^{10}$ light years</td>
</tr>
<tr>
<td>Age of the Universe probably</td>
<td>$10^{20-21}$</td>
</tr>
<tr>
<td></td>
<td>$10^{10}$ years</td>
</tr>
</tbody>
</table>

**How Long is Time?**

The introduction of the unit 'light year' reminds us that space is associated with time. If we see a celestial object $10^9$ light years away, then we are seeing what was going on $10^9$ years ago. When we say that the Crab nebula (the term 'nebula' is used for any celestial 'mist'). This time it is in our galaxy) is the remnants of a
star that exploded in 1054 we mean that that is when the light of
the explosion reached the Earth, on 4th July actually. The explo­
sion itself occurred hundreds of years earlier.

Consider a distant galaxy or one of those strange objects known
as quasars which are much denser and incredibly bright having masses
equivalent to millions of suns (i.e. comparable with galaxies) but
dimensions much smaller than that of a galaxy (almost comparable
with a giant star) and suppose our observations of its red-shift
show it to be getting on for $10^{10}$ light years away. Obviously
this implies that the Universe must be at least that number of years
old. Now one of the intriguing things that is emerging as we look
back in cosmic time is that what we see then is not quite the same
as what we see in our neighbourhood — the nebula in Andromeda for
instance which as a close neighbour we see as it was a mere two
million years ago. Quasars seem to have been more common earlier
in the life of the Universe. This suggests very strongly that the
Universe is growing; perhaps we should say growing old or evolving.

The same idea is strongly hinted at by the recession of the
galaxies. If they are all moving away from one another with a
velocity increasing with their separation, then they surely used to
be closer together and presumably there was a time when they were
packed in what has become known as the primeval fireball or big bang.
If one accepts, as any scientist must in order to pursue his craft,
the basic pre-supposition of the Uniformity of Nature, there is only
one plausible way of escaping the 'big bang' idea as necessarily
implied by the recession of the galaxies. That is the steady state
model of the Universe. This supposes that matter is continuously
created to take the place of that lost from the visible Universe by
galaxies passing out of sight. This picture is now virtually extinct
because of the evidence for an evolution of the Cosmos, that it dif­
ered in the past from how it is now.

It seems almost certain therefore that there was a big bang to
start with. Whether there was an "earlier contraction" would seem
to be beyond the power of science to discover. What we don't know
yet, though we may hope to find out, is what is likely to happen in
the future. One possibility is that the Universe will go on expand­ing
for ever albeit the expansion rate getting slower. Another is
that it will slow down, reverse and start to contract, possibly osci­
llating on like this for ever. Recondite as such ideas might seem,
they are by no means beyond our ultimate discovery providing we can
take the Principle of Uniformity as valid. It is really all a
question of how much matter there is in the Universe. If it con­tains
enough matter, even the most distant and truant galaxy must
eventually slow down and return, responding to the gravitational
pull of all the other matter in the Universe.
If it is almost beyond scientific dispute that the Universe has  
an evolutionary history, it is even more certain that stars are born,  
grow old and die and almost as sure that planetary systems are born,  
evolve and eventually collapse into their parent sun unless disrupted  
by some stellar encounter. Moreover, the question of where stars go  
when they die may have a bearing on whether the Universe is open or  
closed, whether the expansion will go on indefinitely or be slowed  
down and stop, probably to be followed by a contraction, since dead  
stars must contribute to the unobserved mass of the Universe.

The History of Stars and Galaxies

Galaxies are composed of stars many of them being second generation.  
By this we mean they have been formed from matter that was previously  
part of other stars. We can tell this from their optical spectra  
which declare their chemical composition. When we find many and  
varied heavy elements like iron, rather than just light gases like  
hydrogen and helium, we know that these have come from the cores of  
an earlier generation of stars since it is in stellar interiors that  
heavy elements are synthesized. Indeed, it is the fusion or "burning"  
of hydrogen or helium to give heavier elements that is the  
source of a star's energy.

Stars condense from clouds of interstellar dust and gas where  
some irregularity occurs giving a density greater than average. This  
irregularity with its greater density of matter results in a gravi-  
tational mutual attraction which draws the matter together. To  
start with, the greater density makes the radiation of the energy  
aquired by the infall easier but soon the rising temperature and  
density oppose the gravity and quasi-equilibrium is reached in which  
the protostar continues to shrink getting more massive and much more  
dense than the surrounding dust and gas cloud as it captures matter  
from it. As the process proceeds, the centre becomes very hot since  
heat is generated by the infalling matter but increasingly prevented  
from escaping by the blanket of surrounding material. Eventually,  
a temperature of a million or so degrees (K) is reached and thermo-  
nuclear "burning" starts. This is a new situation. Both the rad-  
iated heat and light (mostly X-rays) and the pressure of the immen-  
sely hot gas oppose gravity, prevent further contraction and the  
system stabilizes.

At some time during this process some of the circumambient  
material may condense to form planets but the process is normally  
screened from terrestrial eyes and instruments by the huge dust  
clouds in which it is going on. Quite often, perhaps more often  
than not, two or more stars condense close enough to be bound to  
each other gravitationally and to orbit each other as a binary sys-
tem. If they are very close, they will exchange matter between themselves in a way that affects their future.

The life of a star depends on many factors; its speed of rotation, encounter with interstellar material but most of all on its mass which may be in the range $10^{-1}$ to $10^2$ times that of the Sun. Less massive objects would never start up nuclear fusion, never light up that is, and so never become visible. Of course, in that case they would represent some hidden mass in the Universe. Heavier objects would tend to become unstable and blow off material until the stable size is reached. Strangely, the heaviest stars have the shortest lives – about a million years. If the history of life on Earth is anything to go by, and in this the scientist has nothing else to go by, the heaviest stars are unlikely to have biologically populated planets. The environment is changed too rapidly for evolutionary processes by slow adaptation. The same would seem to be true a fortiori of mutually orbiting double stars. Of course, there may be a "biology" quite distinct from anything of which we have experience and adaptive processes very different from biological evolution as we know it. It is probably reasonable to assume from this that only a small fraction of stars equipped with planets are suitable suns for highly organized creatures to dwell under. The evidence of our solar system would suggest that most planets are quite inhospitable even when they have well behaved suns. Moreover many whole galaxies seem unsuitable homes for biological systems. Even so, with $10^{20}$ or more stars in the Universe, other inhabited planets could be very likely even if only one in a billion stars were hospitable.

As a star consumes its nuclear fuel of light elements, dramatic changes take place. The Sun may be expected to swell until it engulfs the Earth. Instabilities occur both in size and brightness. (The two are of course related.) For many stars, especially the more massive, a dramatic and highly disruptive explosion ultimately occurs, blowing off the outer layers and exposing an unimaginably hot and bright core which collapses to almost inconceivably huge densities. In any event, the dying ember of a star resembles nothing in our more direct experience and is probably often the centre of events that can reasonably be called bizarre.

The history of galaxies is much more uncertain and possibly more diverse. Exactly how the condensation of primordial matter from the 'big bang' is related to the obscure conditions prevailing in the first moments of the Universe is not known. Our experience of science would lead us to seek some rather general understanding in which no special properties of the 'big bang' need to be invoked to account for the irregularities that gave birth to galaxies, clusters of galaxies and even clusters of clusters. However, while the 'big bang' seems certain; we can even detect the remnants of radiation
emitted as the so-called 3 K microwave isotopic background (i.e. corresponding to radiation from a body at 3 K); the events spanning the expanding fireball to the expanding system of galaxies are obscure. We know there are active galaxies in which immensely energetic processes are occurring. Some show huge jets or blobs of matter apparently shot out for millions of light years. Some show very hot and turbulent cores. Some emit radio waves or X-rays in vast quantities. Some have as their cores the superstellar quasars which seem to have been more common earlier in the life of the Universe and which may be a stage in the life history of many a galaxy. It seems not unlikely that these contain gargantuan Black Holes.

But now we must turn to consider some of the theological implications of all this.

_In the Beginning was the Word_

"Before all worlds". These are the familiar and ancient words, translated into English, with which in 325 AD the Council of Nicea sought to formulate the eternal character Jesus. The Council wanted to be true both to the way the Bible speaks of Christ and to the understanding of that teaching which had grown up in the Church with its Greek and Roman cultural background and superimposed Old Testament world view. It was also, and most immediately, trying to deal with the views of the heretical bishop Arius.

"Before all worlds", "world view". I wonder what the word conjures up in our minds today and whether it is anything like what was meant by the biblical authors or by that fourth century Council. Modern cosmologists speak of a world-line meaning a path in space-time which is no doubt quite different again. The word most commonly used in the Greek of the New Testament and translated "world" in the "King James Version" of the bible is _kosmos_ which, in its modern English meaning, is widely current amongst astronomers and cosmologists today. It is now really synonymous with Universe — the whole of material existence. Another word often translated "world" which was doubtless in the minds of the deliberators at Nicea is _aion_ which is just our word "aeon". If 'cosmos' seems primarily to convey the idea of the whole of space, 'aeon' certainly speaks of time, literally ages.

Now what the Nicene Creed says, based no doubt especially on the first three verses of the "Letter to Hebrews", is that God the Son precedes "all worlds". The Bible gives us a picture of a Universe and everything in it dependent on God for its existence. It was not just started off by God, or sorted out, order from chaos, but the whole from beginning to end (if it has a beginning and end) comes from Him whom St. John the Theologian calls the Alpha and Omega
In fact the word *aion* seems to include orders of spiritual being as well and is translated "all orders of existence" in the New English Bible version of Hebrews 1.2. The idea of God the Son having both priority over and creative and sustaining responsibility for all things is central to Christianity which before all else is theistic. "He exists before everything, and all things are held together in Him" says St. Paul in Colossians 1.17. But the thought (I would rather say revelation) is much older. It impregnates the Old Testament, is the strength and glory of Judaism and, separated from the sensitive human sympathy of Jesus, leads in the Muslim faith to the awesome and distant majesty of Allah.

The magnificent fortieth chapter of Isaiah with its rhetorical, "To whom then will you liken me, whom set up as my equal? asks the Holy One" is saturated with it. The Psalms are full of it too. (Psalms 8, 19, 104 and 139 to mention examples only.) So is that much older story in the book of Job. But of course the bible opens with God's priority. The Gospel of St. John repeats it. The First Letter of John echoes it and the Book of Revelation closes Holy Scripture with an anthem on the theme. It is thoroughly biblical to say, "Source of the whole". "In the beginning was the Word of God".

**Source of the Whole**

We shall, however, fall very far short of the way the bible depicts God's relationship to the Cosmos if we limit it to an emphasis on the beginning in a temporal sense. First we must take note of the bible's teaching that every event and phenomenon proceeds, as it were, direct from the *fiat* of God. We must heed the teaching of Jesus that God "makes His sun rise ... and sends the rain". This biblical emphasis is all too often watered down in the minds of Christians. It becomes a view that God has so ordered the Universe that sunrise and rain come impartially which misses Christ's point that God, affronted by evil so loves that He still sends good and only by so presevering ourselves can we, in practice, be His children. God goes on doing it.

The idea of a Universe that ticks on by itself in a wholly autonomous manner and of a God Who occasionally intervenes is a largely pagan concept. It is far removed from Isaiah's picture of a nightly stellar procession which repeats, with no absentee and none out of place, because of God's "great might". It is as far too from the Psalmist's bold use of the Hebrew *bara* (= create — as used five times in the first chapter of Genesis) to describe as he does in Psalm 104 v.30 the familiar miracle of animal birth. There is a most admirable effort to recapture this belief in the immanent
and continual activity of God, in the credal statement of the United Church of Christ with its striking use of the present tense: "He calls the worlds into being, creates man in His Own image and sets before him the ways of life and death" — I wonder why they used "worlds" (Aeons?) instead of "Universe" (Cosmos) there?

The concept of a Universe which is like a self-operating clock with God relegated to the role of clock-maker is deistic. Newton is said to have thought of God like this and the beauty and power of his deterministic scheme of classical mechanics undeniably fits the picture, though in fact even Newton called in God to keep the celestial system in adjustment. (Modern quantum mechanics is less suggestive of a deterministic system.) It was because Laplace, a hundred years later, succeeded in a mathematical analysis of the solar system that left no need for occasional regulation, that he made his famous reply to Napoleon about the absence of God from his thesis:— "Sire, I had no need of that hypothesis". That is precisely what has been going on ever since. No doubt, like Newton, we are still only children playing on the shore of the unfathomed ocean of knowledge, yet every new insight and every fresh understanding declares again that Science has no need of God as a hypothesis. Nor should this surprise us. A God who is only a hypothesis to explain what we do not understand is unrecognisable as the God of the Bible. The biblical idea of God is of One Who is the "Source of the Whole", not was but is, or perhaps better, was, is and will be. There is, I believe, an echo of this in the revelation of the divine Name to Moses at the Burning Bush — "I am what I am", "I will be what I will be" — source of "all that is and all that ever was and all that yet will be."

In talking now about the beginning I therefore insist that the middle and the ending are no less God's work. The interesting and exciting things about the beginning in the temporal sense are scientific not theological. In fact, there is really only one more theological remark that I want to make about the beginning and it is this; I speak of God as "back and back beyond all time and co-related space". Now most cosmologists today believe that the history of the Universe can be traced, at least in broad outline, as we have seen "back to back" to within a minute fraction of a second of a "Big Bang" — a seminal cosmic explosion from which all we now see or detect or infer has been unscrambled. But for a while many cosmologists interpreted the rather scanty evidence then available as suggesting that the life of the Universe extended indefinitely, perhaps infinitely, into the past. Personally, I rather liked this so called "Steady State" theory mostly for aesthetic reasons. There was not much else to go on and it certainly was not because I thought there were any theological pros and cons. There were, in practice, some formidable conceptual problems connected with a rather open-ended proliferation of infini-
tes, but I liked it all the same and half expected the problems to
go away when sufficient geometrical genius had been brought to bear.
If the Big Bang theory is right, then in its simplest form it
suggests that there is a beginning to time, a sort of t = 0 at
around 15 thousand million years ago. On the other hand, no-one
can be sure that the "Big Bang if such it was", was not preceded by
an "earlier contraction", and what is even more merry no-one can be
sure which way time was running during the contraction if there was
one. (To put it another way; we do not know whether a hypothetical
observer living in such a hypothetical contraction would have seemed
himself to be living, like us, in an expanding universe because time
for him was running the other way. That is to say in a way that we
from our position here and now could call backwards.) But let us
not complicate it. God, if He is God indeed, is the Giver of the
Whole. Space and time are His doing and if in the little time-scale
of this Universe He gives infinite space or infinite time, it merely
declares his greatness.

Contingency

The relevant theological doctrine is contingency. The Universe
macro- and micro-scopically is His doing and His choice. He does
not do it because He has to and He does not do it the way He does
because there is no other way. It is not merely dependent upon
Him but contingent. If in any sense it has to be as it is, that
can only be because He is as He is. It fits, indeed derives from,
His character. "The heavens tell out the glory of God". This
doctrine of contingency, that the Universe is as it is by divine
choice, is basic to theism and excludes the increasingly popular
non- or perhaps sometimes sub-Christian doctrine of pantheism.
Pantheism identifies God with the Universe — a noble idea but still
far short of the transcendence attributed to Him in the Bible. And
while I am talking about -isms let me fill out the picture by recall-
ing the no doubt unthinking attitude of some Christians who speak
and maybe even act as though there is that which exists of its own
right so to speak, not given by God. It is easy to slip into imag-
ing that time or space or more commonly both, exist apart from
God, that His relationship to them is not that of Creator, that He
inhabits them. The idea that space and time do not derive from
God is one form of Dualism. Another more subtle form is the idea
that good and evil are two autonomous, self-existing entities. But
the Bible will not yield an inch on this either. In the New
English Bible, Isaiah 45, 6-7 reads, "I am the Lord, there is no
other; I make light, I create darkness, author alike of prosperity
and trouble. I, the Lord, do all these things." The Revised Stan-
dard Version translates like this, "I make weal and create woe" and
it is interesting to note that "create" here is the Hebrew word
"bara" as used in Genesis 1. The King James version is even more uncompromising — "I make peace and create evil".

In theism evil is God's creation as a necessary and in a sense, inevitable outcome of the misuse of delegated freedom. This, surely, is the awesome but so true implication of God "visiting the sins of the fathers on the children", grand-children and great grand-children. Any social worker knows that that is a fact of life, as the Christian would say, of God's world. The fact that we recognize this situation in human society and try by education and by the compassion and gospel of Christ to ameliorate it, simply illustrates what St. Paul (Romans 11:22) calls "the kindness and severity of God". God creates everything. He creates what to us is an evil as an act of mercy. It starts most often as an act of mercy to an individual, a voice of warning which, unheeded, may eventually be unheard, but which calls then to others — family, fellow citizens, the race. So it is that Amos, that towering prophet of social justice and impending doom says, "If disaster falls on a city has not the Lord been at work?"

All of this will raise questions about what we are to understand by the laws of Nature, by chance (and Providence) and by freedom in the Universe as science sees it today. For the present, having noted that beginning when referred to God's activity has to mean author, giver, source in far more than a temporal action at \( t = 0 \) sense we must turn back to the scientific ideas and see what we can learn from science about those creations of God, space and time and how closely 'co-related' they are.

Relativity

One of the great discoveries of the century came with Albert Einstein's insights into the close relationship between space and time as developed in his Special Theory of Relativity and his slightly more speculative development of the relationship between space and gravitation and matter known as the General Theory of Relativity. Again because of Einstein, the idea that gravity can be interpreted geometrically implies not only a relationship between the geometry or configuration of space (or perhaps better, space-time) and matter, but also energy, for no discovery of Einstein is better known that the equivalence of mass and energy expressed by \( E = mc^2 \) where \( c \) is the speed of light in a vacuum. Mass here means the prime quality that matter has, to resist a change in its motion — Newton's so-called Second Law. What Einstein says is that this quality of inertia which we customarily associate with matter is really a quality of energy in whatever form it occurs.
For example Einstein's Law implies that a watch would be heavier, have more mass, more inertia when fully wound. Because the factor $c^2 = 9 \times 10^{16}$ (metres per second)$^2$ is very large, the effect would be not only quite unnoticed but also undetectable. But it would be there all the same. For far larger amounts of energy than could be stored in the mainspring of a watch, it cannot only be detected but becomes quite important. The increased inertia is nothing to do with increasing the number of atoms and molecules in the watch. However, the subject that treats the basic particles of matter is Quantum Mechanics and Dirac's Relativistic Quantum Mechanics provides us with an insight into the conversion of energy into actual atoms and molecules. Because of the huge factor $- 9 \times 10^{16}$ that we have already noted, we cannot expect, even if we could master the technology, to make the brass, iron and jewels out of nothing but energy, but in principle it could be done.

Dirac's theory, in fact just because it is concerned with the basic particles introduces us to a way of thinking about the properties of space which shows it every bit as "real" as more tangible matter, but we must get back to the bigger scale, broader relationship between space, time and matter implied by Einstein's two theories of Relativity. The mystery of being is so elusive as to call for the utmost humility, precisely that humility that seems to make it easier for great men of Science to enter the kingdom of God than for some others. If a biblical epigram were needed for Einstein's theories and Dirac's and for much else in modern physics it could be, "Judge not by the appearance".

Einstein's Special Theory starts from the observational fact that the speed of light (in a vacuum) is the same for all observers no matter how they may be moving.

The ramifications of this remarkable result are incalculable. One result is that nothing can be accelerated to a speed greater than that of light, another is the equivalence of mass and energy already referred to ($E = mc^2$), a third is that the mass of anything increases as it approaches the velocity of light. (This is really an aspect of $E = mc^2$; as the kinetic energy increases so does the inertia.) Perhaps the most startling result is the discovery that two events that occur at the same instant of time for you may not be simultaneous for me if we are moving rapidly relative to each other. Moreover our measurements of a length will differ.

Perhaps the simplest (and profoundest) way to summarize these effects is to say that it is an observational fact of physics that space and time cannot be treated as distinct entities but are a single whole — space-time.
Einstein's General Theory is, as we have said, concerned with gravitation. From the point of view of mathematical ways of representing our World, it has the interesting property of replacing the Newtonian idea of gravitational forces between masses by a geometrical distortion of space-time itself.

For the path of a particle like a bullet (say) in a gravitational field it operates rather like this. In the absence of air, a bullet's path deviates from a straight line by the fall due to the pull of the Earth's gravity. Einstein replaces this effect by changing the geometry of space-time in which the bullet's path is traced curving it in a way prescribed by the presence of the terrestrial mass. In the geometry of this curved space-time, the path is restored to a "straight line" of geodesic, as it is called by analogy to the shortest path between two places on the surface of the globe — the geodesic or "great circle" along which ships sail or planes fly to accomplish a journey in the shortest time in the absence of winds and currents. There is an analogy in the fact that the path taken by a ray of light passing through a refracting medium, that is, one like water in which the velocity of light is less than its free space velocity, is always the path which involves the shortest time of travel.

The General Theory introduces us to two important ideas. The first of these is that a "curved space-time" allows at least the possibility of a finite yet boundless Universe. Just as the surface of a ball is quite finite and has a definite area given by $4\pi r^2$ where $r$ is the radius of curvature so the Universe might turn out to have a finite and quite definite volume. And just as there is no boundary to the surface of a ball as Christopher Columbus demonstrated for the Earth to the confusion of his dissuaders, so the Universe may have no boundary, and for that reason no centre and, of course no place which is farther from the centre than any other.

This concept of a finite but unbounded Universe is interesting in the meaning it suggests for a phrase like "beyond space" for in this case what is beyond space is certainly not space in the sense we normally use the term. To suggest that it was, would be as absurd as suggesting that there must be land and sea beyond the surface of our globe. There is nothing beyond space and if the phrase is to mean anything it must mean "other than space". The Eternal God is surely utterly other than space-time. He creates it and gives it and all within it. He must be "beyond" it.

A second implication of the General Theory is the probable existence of Black Holes with the puzzling concept of inner boundaries or "event horizons" within which the physics would seem to be unknowable.
The General Theory of Relativity and Dirac's Relativistic Quantum Mechanics were early pointers towards the increasing role played by the properties of space in physical theory such that its symmetries and intrinsic characteristics, symbolised mathematically, are the underlying interpretation being given to the varieties and properties of fundamental particles. In the search for a Grand Unified Theory of the basic forces of nature the characteristics of the particles are being subsumed in the characteristics of space.
The idea that robots, based on future generations of computers might one day develop an independent intelligence of their own is now a commonplace. Dr Gordon Clarke asks what is meant by intelligence in such a context and whether it could in any way threaten Christian faith.

1. INTRODUCTION

The desire to create mechanical or organic artefacts which possess 'intelligence' has long fascinated humankind. It was discussed in abstract by some of the pioneers of computing machines in the last century, but only in the last forty years has it started to emerge into a shady kind of reality with the advent of powerful general-purpose computers. Thirty years ago, the subject was raised for the first time before this Society by Donald Mackay, who stated that "Factual developments make it no longer derisory to ask: could an artificial mechanism be said to have a mind?" He concluded that we could not reject this possibility on logical, philosophical or theological grounds. Indeed, the impetus given to Christian thought by the development of such artefacts should serve to illuminate our understanding of the Christian doctrine of man, rather than undermine it. At that time, the questions raised were largely hypothetical as computing machines (although most impressive compared to pre-war devices) were clumsy, bulky and slow by modern standards and did not have the capacity to deal with more than straightforward repetitive calculations, let alone the simulation of human thought.

Many believed, however, that Artificial Intelligence (AI), as the science of modelling human thought processes on computers has come to be called, was a worthy and achievable goal. Since the 1950's, AI has grown out of nothing to a major research interest in the USA, in Japan and to some extent in the UK. In the next few
years, as cheap microcomputer technology brings computing power within the reach of more and more investigators, the field is bound to expand apace. Recent declared objectives of the Japanese computer industry anticipate that human-like intelligence in computers will be with us by the 1990's. These aims are ambitious, but they have been taken seriously in the US and resulted in some alarm in UK government circles.

It is a good time, then, to re-examine the impact of machine intelligence on Christian views of man and society, for if it can be shown that intelligent behaviour (meaning activities with which we would normally associate human reason), thought or indeed consciousness can be programmed into a machine, what do we learn about the nature of our intelligence, thought and consciousness?

For Christians, the issues raised by AI include:

(i) A priori philosophical problems about the nature of man and human society, and

(ii) Practical effects of applied AI.

In the first category, the possibility that human-like intelligence could be simulated in machines makes us ask questions such as:

(i) Is our thinking merely mechanical? Hence what of free will, rational choice and moral responsibility? Is faith an illusion — an artefact of the flickering of action potentials in the brain — as reductionists have claimed?

(ii) If machines can exhibit mind-like behaviour, what is the mind? How do mind and brain relate? What of the 'soul'?

(iii) Is there any room for the supernatural in the scheme of things? What about survival after death in particular?

(iv) Does machine intelligence demean our status as human beings or undermine our notion of ourselves as rational and indeed spiritual creatures? How would this affect our behaviour towards each other?

In the second category — the impact of widespread use of intelligent machines — we should examine the psychological effect on individuals working with such devices as well as the social issues like employment, privacy and control which also demand a Christian response. These problems are only considered cursorily in this paper, however, as it is important to clear the philosophical ground first.
My aim is to air the philosophical issues in a comprehensible way and lay some of the ghosts which prevent us thinking clearly about brains and minds, be they begotten or created. I intend to demonstrate that the conclusions of Prof. Mackay's paper remain valid; that AI, properly understood, is not a threat to faith, and that it can help us to discern our own nature more clearly.

I will begin by mapping out briefly the achievements of AI research to date, then examine objections to the realisation of machine intelligence in principle, and explore the mind-brain problem. Thence, the inevitable step is to assess the issues involved in machine consciousness. Finally, I will discuss the implications of AI for the Christian faith in the light of the questions listed above.

Setting out on this task at the junction of my own fields of interest, I am aware that I may oversimplify the issues. I can only ask the reader to bear with me and assess the validity of the conclusions on their own merits.

2. HOW FAR HAS AI RESEARCH PROGRESSED

To give a bald definition, AI is the attempt to duplicate in an artefact intellectual activities which we would normally expect to require human reason. Research has ranged from game-playing programs to intelligent 'assistants' which embody and manipulate expert knowledge. We need to examine the rationale of these developments and see how far research has progressed.

It is intrinsically very attractive to draw parallels between the digital computer and the brain — both being general purpose information processing devices which achieve their results by carrying out large numbers of primitive operations at great speed using standard 'on-off' components. However, the parallels are somewhat superficial, for example:

(i) The brain is not wholly digital in its operation. The frequency, not just the presence or absence of nerve impulses is important; so is the integrating capacity of nerve cells, which fire according to the net effect of excitatory and inhibitory inputs.

(ii) The brain carries out much processing in parallel and as such is more like a conglomeration of computers than just one. Large modern computers, too, often contain a number of processors, but not yet to the same extent.
The memory system of the brain is far more sophisticated than computer memory — it is distributed, so patterns can successfully be rebuilt from part information.

Functions lost through damage can be taken over by other parts of the brain. Some redundancy of memory is present in modern computers for the same reason, but back-up processing is rare as yet.

The brain uses a different kind of symbolism from that normally used by computers — its notation is such that it can locate information by its relationships with other information very quickly, but it cannot easily carry out complicated calculations. 'Relational' data retrieval in computers is at an early stage of development.

Nevertheless, it was demonstrated in the 1930's that the digital computer is capable of simulating any process which can be specified as a series of logical steps, so it should not be impossible to reproduce within the very different hardware of the digital computer the logical processes which go on in the brain. For example, distributed memory could be simulated mathematically in a computer program by Fourier Synthesis which also describes the relationship between a diffraction pattern and its image. The brain-memory could be seen as a transform of the information it carries in the same way as a diffraction pattern is a transform of an optical image (in a hologram, for example).

It is likely to prove very difficult, however, to carry out such detailed 'simulation' of brain processes on a computer or even a network of computers. We know so little about the processes themselves. A more promising line of AI research is that of the 'synthesis' of intelligent responses, such that a machine appears to behave intelligently to us, regardless of whether the intelligence is achieved by the same processes as the brain uses. In practice, the approaches of simulation and synthesis have run along side by side, with synthesis becoming possible because of discoveries about how the brain does things, and ideas about brain processes being investigated via synthetic experiments. It is fair to say that the progress made so far is somewhat disappointing compared to the expectations of thirty years ago, but there have been some remarkable successes. What follows now is a conceptual rather than chronological chart of the developments, spotlighting some of the important milestones.
(i) Information processing

Early ideas on modelling human thought, in the 1940's, were based on the concepts of cybernetics, with feedback as the central notion, providing a means by which purposive behaviour could be explained—just like process-control systems.

The goal to pursue seemed to be that of modelling the brain at the structural level—neural networks and the like—to try to reproduce some of the results of brain activity. The correspondence between the on-off behaviour of both neurons and electronic switches seemed to suggest that substantial brain structures could be modelled on digital computers. The practical difficulties of this approach, however, rendered it ineffective, except for the related discipline of 'automata studies' in which logical chunks of brain function are modelled, rather than physical brain structures. Instead, an entirely different idea became central; that of modelling the brain not as a biological object but as an information-processing mechanism.

In this context, it is hard to decide whether to refer to intelligent machines, or intelligent programs. The issue certainly does not arise until they are brought together. We start to see here the logical independence of the functions the brain performs and the structures which embody those functions. Thus as general-purpose digital computers which could execute stored programs began to develop in the 1950's, AI research began to flourish; the digital computer as a symbol manipulator modelling the function of the brain as a symbol manipulator. Primitive game-playing programs and programs which could prove theorems in mathematics or formal logic (sometimes in innovative ways) soon appeared.

(ii) Rules of thumb

The rationale of programs of this kind was largely a matter of trial and error pattern matching, searching a large number of possibilities for the optimum solution. The clever thing was the way searches were economised by 'heuristics'—rules of thumb built in by the programmers. Heuristics act as a kind of filter for solutions, so that inappropriate ones are quickly rejected and the best is located without wasted effort. Recent highly successful chess and backgammon-playing programs have exploited these techniques.

(iii) Internal models

Despite the prevailing beliefs of behaviourist psychology, it was evident that humans and animals carry around within them a 'model' of their world. In the same way, it was realised, an intelligent program must be able to access a great deal of information about its world in order to display any intelligence in its activities,
however restricted. The program could explore this internal model (which included information about its own capabilities), before coming up with an answer to a problem it was given. The responses would thus appear remarkably sensible, since many unfruitful lines of approach could be rejected straight away. By the mid-1960's, it proved possible to produce programs of this kind, with limited success.  

The fascinating subject of programming computers to understand natural language illustrates the need for internal models. The problems of understanding a sentence in 'plain English' are enormous. Consider statements like "The man with the girl with the long hair hit the dog with a hammer with vengeance" or "The old man's glasses were filled with sherry". To interpret a sentence requires complex information-processing involving problem-solving at a number of levels in a hierarchy of goals and sub-goals. All the time reference must be made to a vast stock of information concerning syntax, grammar and the relationships between concepts. In 1950, Alan Turing suggested that genuine machine intelligence would have been achieved when a human being could converse via a terminal with either another human being or a machine for some minutes without being able to tell the difference. Within a very limited context there are programs, written nearly 20 years ago, such as the famous computerised psychotherapist, ELIZA, (see also Ref 12) which begin to meet this criterion. Nevertheless, they are not interpreting language 'intelligently' as described above. Their operation is based on pattern-matching, picking out particular key words in the input and then selecting appropriate responses in the light of previous conversation. They do not in any sense 'understand' what is going on.

(iv) Knowledge as a process

A major step forward in the development of programs which accept natural language input and respond in natural language was made by Terry Winograd in the early 70's. His novel departure was to regard language, meaning, knowledge and reasoning as integrated parts of human thinking rather than entirely separate processes. Thus rather than our hearing or reading a sentence, analysing it for meaning and then working on the meaning using pattern matching, all these processes would occur together, referring to each other through many cycles of refinement. Knowledge is actually embodied in the way these processes inter-relate, so the structure of the program itself forms part of its internal model.

This led to a fundamental change in the way natural language programs were written. It has been suggested that the original example of this technique — SHRDLU, a program which responds to natural language commands to move around objects simulated in the machine — is the first program that actually understands what it is doing, in a very limited but real sense.
(v) Self-improvement

The ability to learn is central to human intelligence. Problem-solving, creativity, language all depend on it. Thus the simulation of intelligent processes on a machine also depends on the ability of programs to learn; that is modify their own instructions without external intervention in response to information gathered from the environment. G.J. Sussmann\textsuperscript{6a,9c} has produced such a program (called HACKER) which resembles SHRDLU in its activities, but learns by its mistakes. It is able to reprogram itself to accomplish tasks it has failed to carry out at the first attempt. This significant achievement owes something to the particular computer language developed by Sussmann et al for its implementation.\textsuperscript{9d} The development of suitable languages for AI work has absorbed much research effort, but is central to many of the crucial steps.

(vi) The interacting specialists

SHRDLU, HACKER and other Question/Answer programs are able to cope remarkably successfully with their own very-limited worlds. The path to simulation of more extensive thought could be to integrate a large number of such specialist programs on more-realistic worlds. Because the representation of knowledge seems to be inextricably linked with how it's used, this seems a more promising approach than trying to find a general way in which human thinking solves problems.\textsuperscript{5e}

(vii) Some current achievements

Having glanced briefly at the history of AI research, we might ask what the fruits of it are today.

The idea of limited-domain intelligent programs has found expression in the new discipline of 'Expert systems'. This is one of the first examples of commercially viable applied AI, although its basis is a little different from some of the developments described above. 'Expert Systems' (or 'Knowledge Bases') are really intelligent databases which assimilate information about a limited area of specialism (a 'domain') from a human expert and can then make inferences from that knowledge to answer questions. In this way, the Expert System can act as an intelligent assistant, being able not only to answer questions, but also to explain how it comes to its conclusions. Expert Systems have been used successfully in a number of specialised domains e.g. mass spectroscopy, prospecting for minerals, planning the configuration of computer systems and some medical diagnosis and legal problems. It is likely that such systems will take off commercially in the next few years.\textsuperscript{14,16,17}
Programs which provide a natural-language interface for interrogation of business databases are now commercially available and despite high cost, have attracted a healthy number of customers, indicating their genuine usefulness.\textsuperscript{15,16}

Some success has been achieved in machines that can understand spoken, rather than typed, language. This is tricky because not only does one need to separate the words in order to understand the sentence, but one often needs to understand the sentence in order to separate the words. Nevertheless there has been some limited success here.\textsuperscript{15}

A very significant area is that of vision research. It is relatively straightforward to set up a programmable industrial robot if you can guarantee where and in what orientation the object that it must work on will be found. But what if the part is wrongly positioned or faulty — an intelligent robot needs to deal with these things. In the picturesque words of Margaret Boden, we need intelligent robots that can "move about the place without crashing through the window or trampling on the cat".\textsuperscript{9e}

There have been a number of developments in computer-aided teaching and learning which owe a lot to AI research.\textsuperscript{5f,9f} The problem is to get these out of the laboratory and into practical use.

Much research in cognitive psychology, the theory of thinking, is now couched in terms of computer programs.\textsuperscript{4b} These computational models have revealed faults in earlier theories and are themselves a great aid to the development of our understanding of human cognition. Michael Apter suggests that "the computer may prove in the long term to be as important to psychology as the telescope has been to astronomy and the microscope to biology".\textsuperscript{3e} AI has given us a new set of 'mental tools'\textsuperscript{4b} which helps us to think systematically about complex mental activities, and how they are actually put into practice. How does a robot arm go about threading a needle, for instance? Expressing cognitive theories in the form of programs, moreover, makes explicit some of the questions which lurk unasked within a purely verbal statement of a theory.

AI research, then, has made impressive progress in the last couple of decades, but it has been slower and much more difficult than expected. The optimism of early protagonists has not been borne out.\textsuperscript{5a} In the future, particularly in view of the Japanese proposals mentioned above, we could expect to see rapid development in commercial applications of AI such as Expert Systems, robotics and natural language interfaces. Use of AI in education, programming methodology and personal computing may blossom too\textsuperscript{16,17} but we are far from the 'Ultra-Intelligent Machines' which have been predicted by some to be the salvation of humanity from bureaucratic
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chaos and our lack of competence to deal with the complexity of our own affairs. Revolutionary developments in computer architecture ("5th generation computers") and the proliferation of cheap personal computers, however, put us in a very different world in the 1980's, and AI will no doubt ride on the back of these developments. Commercial opportunities for AI now opening up will also speed progress, so although the performance of AI prophets in the past counsels us to be cautious in the estimation of future achievements, we could find ourselves in the age of the intelligent machine sooner than we might suppose.

Nevertheless, there are still doubts in some quarters about the extent to which machines can carry out processes which normally require human intelligence. The possibility that an appropriately programmed machine could embody thought in any human sense at all is denied by some; it is to their arguments that we will now turn.

3. CAN AI BE ACHIEVED IN PRINCIPLE

Some philosophers believe that human thought could not in principle be simulated by computers. There are at least five lines of argument here:-

(i) Gödel's theorem. A mathematical or logical system, Gödel's theorem states, cannot prove everything that can be stated in its own terms, even though its statements might be obviously true to us, standing outside the system. It follows that an intelligent program might not be able to decide the truth of a statement, whereas its programmer could. Therefore, the argument goes, machines can never be as intelligent as humans. This argument is simply mistaken. Gödel's theorem is only true for systems which are 'closed', i.e. nothing more can be added to their rules. A program which can learn would be free of this restriction, so Gödel's theorem does not apply.

(ii) Tacit knowing. Polanyi pointed out that mental processes are not entirely conscious or overtly logical. They involve leaps of intuition, for instance, or inspired guesswork. In addition, a vast background of implicit knowledge, not accessible to introspection, underlies human thinking. To construct a system which mimics human intelligence we would have to systematize this body of knowledge, and formulate ways in which the system might make intuitive leaps. This would be difficult for us to do (e.g. how do you recognise a face or perceive someone as beautiful?) but there is no reason to suppose that it is impossible a priori. Otherwise we could be accused of a kind of "humanity of the gaps". Perhaps an intelligent program could examine its processes more freely and suggest some mechanisms, or we could set up experimental programs to test our own inspired guesses about how we make inspired guesses!
(iii) *Human emotions.* It is argued that a machine could have no understanding of human emotions because it hasn't the physiological apparatus to 'feel' them. There is more to emotions than their subjective element, of course. For a machine to simulate the experiencing of emotions, there must be effects on the machine's behaviour — i.e. on its physical states. Feelings might not be relevant at this level, even if it were demonstrable that there could be no machine analogue of them. The psychological origins and effects of human emotions are as significant as their symptoms, for the latter may vary with the context. The same physiological correlates of feelings, e.g. high adrenalin levels, may be interpreted as excitement or fear depending on the context. If a machine could handle the language of emotion appropriately, then, we could say that it understood emotions, regardless of whether it felt them in the same way as we do.

(iv) *Thinking by analogy.* It is claimed by some that no purely mechanical device can 'think' because the origin of the thinking is not intrinsic to the device, but merely the outworking of the programmer's thinking. Hence any intelligent behaviour in the machine, even one programmed by another machine, is ultimately traceable to a human being, and as such is only an imitation or analogy of human thought rather than 'true thought'. It would not be too difficult, of course, to apply the same argument to the programmer!

This is quite possibly a semantic problem to do with what we mean by 'think'. At present in our conceptual framework, the word doesn't extend to machines, but language appears to shift its meaning at deep levels according to the cultural environment. It may become easier to conceive of machines thinking purely because our language changes. It was not so long ago that European aristocrats could not conceive that the peasants could think, or even that women could.

(v) *The paranormal.* If we include in human thought the paranormal phenomena for which much evidence has been amassed in recent years, it can be argued that AI machines constructed according to physical principles could not exhibit such behaviour and would not therefore fully simulate thought. This follows from a dualist view of mental phenomena, which will be discussed in the next section. However, if mental phenomena (with their subjective correlates) could appear in a machine, it is not immediately obvious that psychical phenomena could not. They are both equally 'non-physical'.

Overall, the philosophical objections to the realisation of machine intelligence are not convincing; certainly no more so than they were 30 years ago, although in practice, of course, the task is still immensely difficult to conceive. We do not have to
proceed far along this road, however, before a major problem arises, which we have touched on briefly above. That is the relationship between mind and brain, whether the 'brain' is organic or not. It is at this point that the relevance of AI to the Christian world view begins to emerge.

4. THE MIND-BRAIN PROBLEM

What is the connection between the mind and the brain, and indeed is it meaningful to ask such a question? It is necessary to clarify this problem to some extent before we can discuss the nature of machine intelligence further. There are two separate issues I wish to distinguish. The first is the relatively trivial question of the relationship between physiological processes in the brain and the 'having of experiences'. Scientific evidence suggests strongly that we can correlate the 'having of experiences' with particular biochemical/electrophysiological events going on in the brain at the time, and implies that there is no objection in principle to correlating all mental events with brain processes. All mental events, that is, from the point of view of an external observer. That brings us to the second problem — that of our subjective experience of mental events; the experiences themselves, in other words, rather than the 'having of experiences'. How can subjective experience come about in an objective causal mechanism — the brain? Bridging both issues, the problem of pre-eminence arises. Does the mind control the brain (and hence the body) as our subjective feelings affirm, or do the deterministic processes going on in the brain dictate what goes on in our minds?

The traditional approaches to these problems have been along two lines. Firstly a 'dualist' approach, in which the mind and the brain are considered to be two different 'substances', and secondly a 'monist' approach wherein the mind is not considered as separate from the brain for a number of quite distinct reasons.

Dualist philosophy may be traced back to Plato, but its best known exponent is Descartes, the 17th century philosopher. Descartes' view was that the mind had an existence of its own, unrelated to that of the body, except that they interacted by way of the pineal gland — a unique structure in the centre of the brain. The mind was firmly in control. As far as our everyday lives are concerned, this is still very much the common sense position. It 'feels' as if the mind controls the body, except for those 'I couldn't help myself' situations. The usual objection to this dualist and 'interactionist' position is that if mind and brain are different kinds of thing, obeying different laws there is nothing that could count as an interaction between them. Moreover, if a
physical system were set in motion (even through a hair trigger) by a non-physical entity, the principle of conservation of energy, it is claimed, would be violated. This is not strictly true. If energy appeared at one place within the system and disappeared at another when an interaction of this kind occurred, or was paid back later in time the principle would not be violated. It is difficult to envisage a mechanism for such a process, however.

An alternative to Descartes' view was put forward by his pupil Geulincx and is known as 'parallelism'. In this form of dualism, there is no interaction between mind and matter. The mind and the brain travel on parallel tracks, as it were, and correlate perfectly for no discernible reason. The best objection to this is probably, in the words of Bertrand Russell, that it is very odd! Parallelism begs all the questions and gives us even more to explain.

The third dualist view regards mental events as by-products of brain processes and is known as 'epiphenomenalism'. It is associated with T.H. Huxley, and is held (implicitly or explicitly) by quite a number of scientists. It is clear that changes in the brain induced by drugs, damage, or electrical probing do indeed result in certain changes in the conscious experience of the person concerned. However, we must ask how this causation of mind by body is to be explained. We would need to postulate a set of psycho-physiological correspondence laws which would account for the existence of the totally non-functional mental 'danglers'. This view appears to accept full physical determinism for mental events, and as such many of its proponents would consider themselves 'monist' rather than dualist in their philosophical position. Nevertheless it does require a separate mental 'substance', albeit a somewhat superfluous one.

With the recent advances in brain research, a number of phenomena have come to light which inspire a contemporary restatement of the Cartesian position known as 'emergent interactionism'. The experiments of Roger Sperry on individuals who have undergone 'split-brain' surgery for the relief of epilepsy, for example, may possibly imply that the two halves of the brain can exhibit separate consciousness. Taking this to be so, Sperry suggests that 'mind is an emergent property of cerebral excitation'. A related but somewhat different view has been expressed for many years by Sir John Eccles, most recently in his book written with Sir Karl Popper The Self and its Brain. Eccles takes a specifically interactionist position, and attempts to locate the mechanism by which mind and brain influence one another. He originally suggested that the synapses, with their probabilistic operation, provided a chink in the armour of mechanism. Lately, he suggests that an area of the neo-cortex he calls the 'liaison brain' is the site of the interaction. Many would feel, however, that this approach smacks of a 'God of the Gaps' argument, and does not offer unambiguous evidence for the existence of a mental 'substance'.

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The 'monist' philosophical tradition can trace its pedigree back to Aristotle, by way of Spinoza, Hobbes and perhaps Leibnitz, who argued that body and mind are different aspects of the same substance. There have been various schools of thought here, from the 'idealism' of Berkeley and the 'hypophenomenalism' of Schopenhauer where the material world was a by-product of mind, to the 'materialism' of Hobbes, where mind was reduced to matter. In modern times, the antithesis between idealism and materialism is reflected in the phenomenological vs. behaviourist schools of psychology. In the former, only mental events are considered significant, and in the latter, only physical.

It is from behaviourism, though, that some very significant monist views of mind and brain have developed. Around the middle of this century the working assumption of behaviourism (that psychology could best be studied by observing measurable behavioural events) gradually turned into a belief that mental events, to all intents and purposes, do not exist at all. This neatly disposes of the mind-brain problem but has the drawback that it is in fact nonsense. Over the last 20 years or so, this has become apparent, and psychology has begun to explore more fruitful avenues. In parallel, a philosophical offshoot sometimes called 'logical behaviourism' suggested that the meaning of mental statements was analysable purely in terms of behaviour (including physiological changes). From there, it is a short step to the 'Mind-brain identity theory' as developed by Feigl and by Place, in which mental events are just physical events described in another language. This position is restated more emphatically as 'central state materialism' by a group of Australian philosophers including Smart and Armstrong.

Identity theory has a lot to say about the first problem I distinguished at the beginning of this section, namely the relationship between brain processes and the 'having of experiences'. It says that these are two ways of looking at the same events. Thus it is meaningless to talk about one causing the other — they are one and the same. Unfortunately, however, many of the stricter 'identity' formulations completely sidestep the second issue, how the experiences themselves arise from pure physiology. Patently, a train of nerve impulses is not the same thing as smelling garlic; it doesn't hurt any less if you know that the pain you feel is merely the activity of your central nervous system. However, to say that 'A is B' is not as simple a statement as it might appear. Identity theorists maintain that the 'is' in 'a mental event is a brain process' translates one language into another, whereas it may in fact be a reductive statement like 'lightning is an electric discharge' which is not an identity statement because it's not symmetrical i.e. 'an electric discharge is lightning' is not strictly true. However, we know from our own experience that mental events like
images, emotions, pains etc. do exist and are not the same things as the brain processes underlying them.

Logical behaviourists such as Carnap and particularly Ryle in his iconoclastic book *The Concept of Mind* have argued that the mind is not a 'thing' or a 'process' at all but merely refers to a disposition to behave in certain ways. Thus there is no more a 'mind' in which I have thoughts, than a 'lurch' in which I might find an unfortunate bride. There is something valuable here in that it shows up how much of our thinking about mind is couched in dualistic terms. We tend to think of mind and body as distinct things, both of which actually exist, although when we ascribe mental states to other people ('He is angry') we are in fact deducing information about their feelings from their physical behaviour. None the less, extending Ryle's analysis to ourselves does give us just this difficulty because we do have experiences and thoughts which are not observable and not merely dispositions to behave. To deny this we would be deceiving ourselves.

Overall, then, the monist positions assert the identity of brain processes and the 'having of experiences', but do not explain the origin of subjective experiences themselves in the deterministic brain. Ayer points out that we do not need to postulate a causal relationship between mind and brain, that the physiologists' story is complete in itself, but nevertheless we cannot throw out the language of mind. The two languages – those appropriate to mind and to brain – do not mix, but they are both equally valid. Neither is superfluous. Boden adds that language which employs subjective concepts cannot be translated into purely mechanistic terms because sentences expressing 'intention' have a different pattern of logical implications from those which do not include subjectivity. So we reach an impasse – the brain processes are there, the experiences are there, the correlations are there, but the connections remain obscure.

On the face of it, some form of dualism is necessary in that subjective experiences are not the same as brain processes any more than a slide is the same thing as its projected image. On the other hand, there is no unambiguous evidence for the existence of a mental 'substance'. Moreover, it is not at all clear that the categories used to discuss these issues are themselves adequate to formulate answers to the problem. It seems likely that the mind-brain problem genuinely takes us to the limits of our comprehension. Perhaps the only way forward here is computer modelling – it is the only tool for the job which we do not share with the ancients.

From the Christian point of view, I feel, the most satisfactory account of the problem is MacKay's 'Comprehensive Realism' which agrees with traditional dualism that mental processes are just as real as physical events, but agrees with classical monism in
rejecting the idea of a separate mental substance. Thus brain events and mental events are not two distinct sets of occurrences, but 'outside' and 'inside' aspects of a single set which are logically separate even though they both arise within the brain.\(30\)

It is important to note that MacKay's solution does not entail a panentheistic view of the universe, in which God is considered to be merely an aspect of the physical universe. The transcendent God of the Bible is neither physical nor mental in substance, and the way in which He affects our lives and we communicate with Him remains a profound mystery whether we consist of one, two or many 'substances'. To do justice to the Biblical revelation of the nature of God, we must see Him as both beyond nature and intimately involved in it, upholding natural processes in their normal operation, not only in miraculous interventions.\(31\)

On the subject of transcendent events, it has become apparent that our understanding of causality in the universe is, at best, incomplete. Parapsychological phenomena and more commonplace 'coincidences'\(32\) as well as religious experience all seem to transcend our notions of physical causation. Some find this convincing evidence for dualism,\(20\) although I do not subscribe to this myself, as I do not feel that these phenomena are necessarily non-rational or indeed have no physical basis. Gravity, after all was pretty mysterious before Einstein, although its laws we must admit were far easier to elucidate.

Before we leave this topic, it may be instructive to return to the theme of programs and computers, which throws an interesting sidelight on the mind-brain problem. In the computer it is clear that the physical description of events is not the whole story; much clearer, indeed, than in organic systems. It is not only the physical machine which must be considered, but also the logical structure of the program, if we are to obtain the results we want. For example it is possible to run the same program on two different computers and obtain the same results, even though the electrical processes in the two cases may be quite different. A program embodies a logical process (such as the calculation of my salary). The function of the program can be described as a series of logical steps without reference to the physical processes which underlie their execution. Can we say, by analogy, that mental processes in the brain can be considered the equivalent of the running of programs in the computer?\(33\) We probably can. The relationship between the logical states traversed by a program and the physical states traversed by the computer running the program is very interesting. It cannot be considered causal in either direction, as the machine executes the program, but the program directs the machine. It is not merely a correlation, as there is a definite relationship between the program and what is going on in the electronics. This is true whenever one considers the state structure of a system as well
as its physical structure. Aleksander has shown\(^7\) how the activity of the brain in certain psychological processes can be described as simple interactions between functional (not necessarily structural) units in the brain; interacting programs in effect. Again, though, we may have missed a turning. Regarding the brain as an automaton with a state structure might help us to understand what the brain processes are that underlie our 'having of experiences', but it still does not tell us the nature of the conversion between brain process and conscious experience. The logic of the program is not, in itself, the conscious experience of the computer, any more than the instructions stored in the cerebellum which enable us to ride a bicycle or tie a shoelace are the same as our conscious experience of those activities.

We need to ask now how the mind-brain problem could be significant in the development of 'thinking machines' and their implications. There seems nothing in the foregoing arguments that would suggest that the programming of 'artificial brain processes' should be impossible in principle, but any suggestion of 'artificial minds' would be more contentious.

5. THE CONSCIOUS MACHINE

We have seen that brain activity underlies mental activity in our own case, and we have seen that it is not out of the question in principle for machines to simulate human thinking. The obvious question now is this. Could there be a conscious agent facing us in the machine? Could computational activity in a machine betoken consciousness just as human brain processes betoken consciousness?

It is interesting that neither a dualist nor a monist view of the mind-brain problem would rule out this possibility, \(a\ priori\). If we were to program a machine with appropriate brain processes and test it somehow for having a 'mind', a positive result would please the monist, clearly, but the dualist could reasonably claim that the 'mind' had arisen as a epiphenomenon which we had not built in\(^6\) or had taken up residence in a structure that exactly suited it. What do we do about the begged question of testing for a mind, though, in any case? This in itself is an example of the general problem of demonstrating the existence of 'other minds' which has exercised philosophers for centuries.

I have already referred to the Turing test (section 2 iii). One objection to this kind of technique for the demonstration of machine intelligence, or machine consciousness in this context, is that it relies so heavily on the equation of linguistic competence with conscious thought. Even though it seems possible in principle to construct machines who think, it is far easier to construct
machines who say they think, or at least give the impression of thinking in what they say. Similarly, it is more difficult to conceive of a machine which has conscious experiences than one that says it does. Of course if a machine’s behaviour at the information-processing level tied in well with my own, and if its description of what it felt like to be conscious was like mine, I would perhaps be churlish to deny that it was indeed conscious. Should we apply a stricter criterion here than that which we apply to people? As Turing one remarked "It is usual to have the polite convention that everyone thinks". Nevertheless for a wide-ranging conversational machine which passes the Turing test, there is no understanding without intelligence i.e. rational thought in the human sense. The problem is whether such intelligence could be generated merely by extending the scope and subtlety of the rules with which the machine was programmed, albeit by orders of magnitude, or whether something else would be necessary.

Experiments with AI so far have revealed at least two 'things else'. One is the necessity for self-reprogramming, which is essential for any living organism adapting to its environment. Not only do brains deal with their own data-capture and information processing, but also with the 'writing' and 'modification' of their processing instructions. For a machine, at present, the programming is external, and any strategic adaptation is only there because someone has programmed it to be. For machines to develop intelligence and hence understanding, they must be able to modify their programs adaptively — precisely the ability displayed by Sussmann's HACKER (see 2 v) in a primitive way. There is already considerable evidence that programs can be written which program better than we do i.e. producing more efficient and economical programs from a human programmer would. It becomes increasingly difficult as these processes become more sophisticated, to claim that the program's intelligence is merely a reflection of its programmer's intelligence. The analogy of a person's intellectual debt to his teachers, mentors and heroes is more appropriate.

The second essential for programs which understand, is the ability to learn from their environment in order to build up their internal model of the world. For machines as well as humans it is necessary to assimilate a huge body of common-sense information in order to understand even a simple conversation — Polanyi's 'tacit knowledge' again.

It should be remembered that virtually all current computer systems are entirely stupid in the AI sense. They don’t reprogram themselves. They don't learn from their mistakes or adapt. This is because they are not programmed to do so, of course, but if we did program them appropriately, remembering that any logical process can be simulated on a digital computer, it is hard to deny the
possibility that a physical machine with its logical program could embody a conscious individual.

How far the language of humanity could be applied to such an individual, of course, depends upon the programming. The monsters of horror films are frightening not because they are not intelligent but because they are not human; that is they do not respond in a way we would expect humans to respond, particularly in compassion. Could a program be good or evil then? Could an artificial mind appreciate beauty or experience love or suffering? If we accept that underlying these moral attributes or subjective experiences there are brain processes, then if we knew the logic of these processes we could indeed program them. Whether the machine would subjectively feel as a human would in the same circumstances is impossible for us to know. In the end a monster is a monster to us because it behaves like one.

The truth of the matter is that we don't know whether a machine might embody a conscious agent. It is a genuinely open question, and quite possibly inaccessible to us.4

6. THE CHALLENGE TO CHRISTIAN WORLDVIEWS

We have seen that it is not absurd in principle to suppose that machines could embody thinking agents, and thus display human-like intelligence, and even consciousness. This brings us to a crucial point. What are the implications of this for the Christian faith?

Machine intelligence is one of those topics which the non-believer is apt to take up as a cudgel on his behalf, as it seems at first sight to be an issue where the discoveries of science have 'disproved' Christianity. The Christian view of man, in the popular mind, is an unscientific, supernatural one involving disembodied souls, unsubstantiated miracles of healing and sentimental beliefs about the sanctity of life. No wonder the apparent triumph of mechanism in AI is seen as a fatal blow.

Well, is it? In the introduction, I posed a number of questions about the impact of AI in principle on Christian world views, and raised some issues on the effect of applied AI which require a Christian response. As we examine those questions now, it should be clear in the light of our understanding of mind, brain and consciousness that AI does not undermine Christian views of man, and indeed demonstrates eloquently that the mechanistic description of an entity does not tell us everything there is to know about it. Other complementary descriptions are necessary if we are to do justice to its nature.
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(1) AI in Principle

The questions raised at the beginning were:
Is our thinking purely mechanical if machines can model it?
What is a mind if machines can have one?
Is there room for the supernatural and life after death?
Does intelligence in machines demean our human status?

All these reflect the effect of reductionism on the popular view of science. If our existence is grounded in a mechanistic base, it is thought, then anything else is not 'real'. People feel, quite mistakenly, that experience explained is experience explained away. This is quite false.

Christians have fought reductionism long and hard both on the basis of dualist views and along lines which emphasize rather the unity of human nature: viz. multi-level science involving different descriptive languages at different levels\(^{35}\) and complementarity between observer and actor views of the same events\(^{36}\) i.e. between mechanism and meaning.

We must ask now whether AI raises any issues which are not satisfactorily dealt with by these traditional arguments. The answer, I think, is no; but there are a number of apparent problems which have led some to claim that the creation of an 'artificial mind' capable of at least some aspects of human thought would automatically disprove the claims of theology. This is perhaps more a consequence of issues ignored by some advocates of hard monism, rather than real problems raised by it. Reductionists such as Monod\(^{37}\) and monists such as Ryle\(^ {23}\) have taken the view that there is no 'ghost in the machine', no 'mind'; it is all mechanism and there is nothing more to be said. 'Everything is stuff and what's not stuff is nonsense'. This, in the popular view would be proven if a machine constructed of nothing more metaphysical than metal and plastic were shown to exhibit intelligence in the sense that we have been using that word. However, as we have seen above, neither dualism nor monism can be proved by AI. We can say that, even now, the results of AI research constitute an existence proof that mental phenomena can be grounded in a mechanistic causal base, in so far as theories of behaviour, belief systems etc. can be presented in terms of computer models. All thinking is mechanistic in that sense, but not merely mechanistic since this says nothing about the meaning of those psychological processes to the creature in which they are embodied. That, after all, is what we are concerned with (most of the time) as human beings. That is what constitutes reality for us.

To understand its physical basis does not stop it being real. To understand the physical and indeed psychological mechanisms of faith, similarly, do not stop it being real to us as persons. It
is no good refusing to pay your gas bill because you know it's only a piece of processed cellulose with chemical dye marks printed onto it by computer. What it means is what matters.

There is no reason then for Christians to fear erosion of their faith because 'intelligent thought' may one day be attributable to man-made devices. Christians argue for the freedom and responsibility of men's minds before God, not their brains, for it is people who think, not brains. None of the developments of the last 30 years make a scrap of difference to that basic premise. The language of free will and moral responsibility is of course mind-language, not brain-language. It is persons who make moral and ethical choices and are responsible for them. This is not to say that in the case of brain damage etc there may not be some limitations on the extent to which society chooses to hold individuals responsible for their actions and so punish them for wrongdoing. That is a judicial issue, not a biological one.

Conversely, there is no Biblical reason to suppose that an artificial mechanism could not be the brain of a conscious individual, so it is neither necessary nor correct for Christians to deny the possibility on Biblical grounds. Hence on the issue of mind, AI holds no threat to faith. Indeed, the relationship between mind and body as two complementary descriptive viewpoints of one set of events has been illustrated by the results of AI research more clearly than was apparent 30 years ago. The concept of the stored-program computer, the logic of whose operation is clearly not derivable from the structure of its components, is an important clue, but beyond this the kind of program capable of simulating cognitive processes — with internal models and the ability to learn from its environment and adapt its own instructions — leads us to a better understanding of conscious thought and the circumstances under which it may arise. Of the machine's subjective experience, of course, only the machine can know.

On survival and the supernatural, popular ideas are influenced more by Greek concepts concerning the immortality of the soul rather than the Biblical view of the resurrection of the body — that is the whole human being, I would argue. Belief in a disembodied immortal soul is somewhat more difficult to hold in the face of science than belief in the resurrection of the body. Clearly, for the whole human being to survive death requires a transcendent view of God as expressed above, for (while being wary of God of the gaps thinking) it is hard to envisage a mechanism for resurrection on our understanding of the physical universe alone. Knowing what we know about the running of computer programs on alternative hardware, however, invites speculation about the re-embodying of the logical structure of a personality. We can say no more.
The fear that intelligence in machines would demean our status as human beings is an echo of the foregoing points on the secular level. The trap is to accept that intelligence in mechanical devices means that our intelligence is mechanical and there's nothing more to humanity. On the contrary, however, mental phenomena are both psychological and mechanistic and the separation of meaning and mechanism is not a matter of opinion but a matter of logic. The only real attack on Christian views here occurs when the existence of self-consciousness, reason or free-will are denied which is to deny our own experience. If machines were programmed to share some of our mental attributes, and ultimately our subjective experiences, this might give us cause to treat them with greater respect for their welfare and even feelings (should we amend a program or switch off a machine against its will, for example), but there is no good reason for this to belittle humanity. If mind-language were to become appropriate for machines and indeed if our brains are properly understood as mechanisms, this does not eliminate our thinking, our feeling, or our spiritual life, for all these are to be understood in the personal, existential dimension, not that of brain cells or electric currents.

The tragedy of this view is that it could become a self-fulfilling prophecy. If people expect to be demeaned by machines they will be. Surely it would be worthwhile for Christians to encourage a more constructive approach, emphasising the personal status of human beings before God and each other, and showing that the understanding of the physical basis of personhood does not require us to renounce its reality. It is the legacy of the industrial revolution, perhaps, that we traditionally associate mechanical artefacts with unthinking unfeeling, inhuman behaviour. It is this very association which may soon be found wanting.

(ii) Applied AI

It is as well to glance briefly at issues which may become significant in the foreseeable future if the more optimistic predictions about AI are fulfilled.

The first question here is the effect communication with intelligent devices might have on our psychology in the long term. Would lonely people find real companionship in an intelligent machine or would more people become isolated from one another because the machines were easier to get on with than other human beings? Might we become dependent on the machine's intelligence and unable to think for ourselves as in E.M. Forster's story 'The Machine Stops'? Slavery to artefacts chosen in preference to relationships with persons has been a recurrent theme of human history from the Kings of Israel to Rubik's cube, but it is not so easy to define when we're talking about intelligent artefacts. From the human side at least,
the tokens of communication or indeed of relationship may appear to be given and received with uncanny ease. A great number of intelligent people have been thoroughly fooled by Weizenbaum's conversational program ELIZA (see section 2 iii), for instance. Again, a clear understanding of what is actually going on in these situations would help us deal with them, but there is no easy answer here.

More immediate social issues are perhaps more important. The effect of intelligent machines on employment is very hard to predict, and must be of significance to concerned Christians. Opinions vary as the long-term effects of technology on employment, but there is no doubt that the introduction of devices capable of high-level clerical skills would encroach on areas of employment which have up to now been untouched by automation. This makes it even more difficult to assess their impact. The main responsibility of planners is again to treat people as people, not brains, machines or numbers. I suspect that fear of unemployment is a major factor in the feeling that AI may belittle humanity.

A final social point is the danger of AI getting out of control. This is not to say that machines may try to take over the world or some such science-fiction, merely that it is possible allow intelligent devices too much unsupervised power over the lives of human beings. A computerised legal system, for example, could leave little scope for argument or appeal. The issues here have some connection with the computer privacy problem. An intelligent machine which could act on information it accessed of its own volition could be as mischievous as any prying eye. The solution here is one of responsible system design and programming, but it is debatable how easy it will be to enforce particular standards in these matters. The detail is so technical that any legislation, necessary as it may be, could turn out thoroughly unwieldy.

The social issues raised by AI are much more far-reaching than those of computer technology today. Indeed the development of intelligent machines may turnout to be as significant to our evolution as the first use of tools.\textsuperscript{40} The dehumanising aspects are real if people believe them to be. We need to guard against the tendancy to treat people (and AI devices?) as 'nothing but' mechanism and grasp unequivocally our subjective, existential nature which is far more relevant to us as rational and indeed spiritual beings.\textsuperscript{41}

7. CONCLUSION

In discussion following Prof. MacKay's paper to the VI in 1952, Prof. Coulson welcomed the changes in apologetics which were being
forced on the Christian community by the discoveries of science. In particular, the demise of the view that the understanding of the mind was to be parcelled out between 'science' and 'religion', for as science inevitably grew, religion's region would gradually vanish. The recognition of the true relationship between science and religion would only come by an enlargement of our concepts, such as the idea of complementarity between observer and actor views of the mind. Coulson concluded with the memorable sentence "A Christianity free from the wateful necessity to defend its little strip of the mind's territory can appear more brave, more convincing, more fulfilling than it ever could have been for earlier generations."

The progress made towards machine intelligence in the last three decades has illustrated how important it is for Christians to grasp this point. No longer can we defend the position that the brain is not describable in principle in mechanistic terms, nor should we feel any need to do so. Instead, our role is to emphasise the fact that mechanism alone does not constitute reality for us. The personal, existential dimension — the actor view of events — is the world in which we have our being. What could be a clearer illustration of this than the appearance of mental phenomena in artefacts?

No matter how far or fast AI develops in the future, our dignity as people and our faith as Christians need not be harmed. It all depends on a right understanding of ourselves, fully compatible with the Biblical picture, as multi-faceted creatures — formed of dust and yet living souls. If we appreciate this, then Artificial Intelligence should not threaten genuine faith.

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FAITH AND RELIGIOUS EXPERIENCE

In this paper the author, a research student in philosophy at Birkbeck College, London, argues that a familiar line of objection to religious belief is misconceived, because it rests on an untenable empiricist assumption. Understanding always transcends immediate sense experience and often involves the discernment of values. Recognition of this fact opens the door to faith.

Some years ago I read a work, by Gabriel Marcel I think, in which the opinion was noted that the world offers grounds both for hope and for despair but never provides sufficient evidence to confirm either. This is a striking and profound observation, yet I believe the attitude it expresses is mistaken, and I wish to suggest that on the contrary hope may be justified. Let me say first of all however, that the sort of hope and despair I refer to relate to religion — one could replace the words by 'belief' and 'disbelief', respectively. The issue then is whether one may reasonably hope to have one's beliefs in God and spiritual reality verified, or at least supported, by consideration of the character of reality.

Most deserving of examination in this connection is religious experience. According to a traditional and widely held view this is concerned with rare and unusual events, hardly ever occurring but dramatic when they do. In contrast to this, religious experience may be thought of as another way of perceiving quite ordinary events. Though such a mode of perception is (perhaps) uncommon, it is neither so rare nor so dramatic as an apparition. It may be of great importance however, since, if I am correct, it is this kind of perception which aids and sustains the growth of sincere and genuine faith.

For good or ill we are all influenced by the philosophical assumptions of the society in which we live. A disadvantage is that many believers comply too readily with the demands of orthodox, secular thought. In particular, it may be taken for granted that the paradigm of knowledge is sense experience — the perception of
colours, shapes, sounds, etc. — in which the contribution of the subject is minimal. Certainly his are the organs of perception, but apart from providing and using this equipment, he plays only a small part in mediating the content of sense experience — his mind being a mere tabula rasa.

According to this view, knowledge is only genuine if it is either reducible to observation, or else is concerned with logical relations. Values and ideals, on the other hand, are claimed to originate in the subject, not in objective reality, for it is deemed inconceivable that there could be experience of moral qualities comparable to perception of physical objects. They are therefore taken to be expressions of sentiment and desire arising from human needs.

Where does this view leave religious faith? Like any other body of beliefs faith must face the test of reduction to direct experience. Religious believers claim that there exists an all powerful and all loving God, Creator and Sustainer of the natural order, who responds to the petitionary prayers of His creatures. But can these propositions be justified by reference to perceptual experience?

Various possibilities suggest themselves, but in the end they are reducible to but one. It becomes necessary to hold that God disclosed Himself at some point, or points, in the history of the world in a way that was directly observable. Thus it may be claimed, in fundamentalist fashion, that the Bible is a more or less literal record of the Divine revelation, and that it provides the empirical content of Christian belief. Faith is justified by appeal to historical testimony. A modified version of this view is that whatever revelation may have occurred in the distant past, the believer also has available to him the evidence of more recent events, e.g. miraculous apparitions and cures of illness.

The radical and agnostic empiricist's response to these appeals is familiar. With respect to the testimony of Scripture, he points to the inadequacy of the Biblical record: its apparent exaggerations, corruptions and internal consistencies; the conflict with evidence from independent and disinterested sources, and so on. Claims for modern miracles he dismisses with the reply that such events lack reliable documentation, or are explicable in terms of ordinary events. When these explanations seem weak, he suggests hopefully that future developments in science may yet provide naturalistic explanations of such phenomena.

Likewise, appeal to private mystical experience is countered by the claim that since independent evidence of its supernatural origin is lacking, there is no good reason to take seriously the
suggestion that a spiritual reality is involved. Accordingly, it is claimed that unusual states of mind are better explained as expressions of imagination issuing from deep rooted emotions, desires, and even, perhaps, neuroses.

The differing views of believers and agnostics afford a possible basis for the observation with which I began: that while nothing in experience validates faith, yet there are phenomena which might be taken to suggest the existence of God and the reality of the spiritual. Thus we are left in a quandary: should we cling to a body of beliefs handed down from generation to generation, and perhaps added to by further claimed revelations; or embrace the scientific programme which seems increasingly to challenge the rationality of religious faith?

It is a measure of how great has been the influence of thorough-going empiricism, that believers now commonly accept the view that only a direct revelation of a supernatural Being can justify belief in His existence. Roman Catholics in particular are strongly attached to the view that the best defence against scientific materialism is appeal to the miraculous. If extraordinary phenomena, inexplicable in natural terms, but having religious connotations can be identified then, it is said, the case for religion will be unassailable. Thus one hears frequently of reports of apparitions (e.g. of the Virgin Mary), prophetic messages, miraculous cures, and so on. Of course this attitude is not confined to the Church of Rome, or even to Christianity; though it is significant that recourse to the miraculous is most often found among those whose outlook is furthest removed from the naturalistic view of the universe.

I do not wish to criticize this attitude in its entirety, for Christianity is, after all, an historical faith. It claims that at some stage in history God disclosed Himself to man in the Person of Jesus Christ; that Christ was raised from the dead, and that He later ascended into heaven. Further, it is part of the Christian tradition that His ministry was attended by many other miraculous events.

For one who is prepared to accept the Scriptural record, it alone is sufficient to establish belief. It may be questioned, however, whether assent to a body of recorded empirical claims amounts to a living faith. Moreover, viewed objectively, it may seem as if contemporary Christians depend exclusively upon the experiences and testimony of others. Yet if this be so, what of the objections advanced by the sceptical empiricist? The decision to believe appears as a choice in favour of one account of the world and his history - that of Christianity - rather than another, without reference to any personal religious experience. On this basis it may reasonably be argued that, given the explanatory power of science, its proven capacity to embrace a wide range of phenomena,
and the principle of economy (not to postulate entities beyond necessity), the rational choice is that of scientific naturalism.

What is wrong with this argument, however, is that it depends on a strictly limited view of religious experience. If such experience is confined to awareness of supernatural phenomena then the number of Christians who can justify their faith must be few indeed. Let us then look more closely at the idea of experience with which the argument began.

Those against whom this discussion is directed hold to an uncompromising version of the *tabula rasa* account of the mind, according to which mental activity is concerned only with the generation of ideas originating in natural conative attitudes and other innate dispositions. This account badly misrepresents the truth of the matter. It is now widely accepted that there is no such thing as a bare act of perception which does not subsume its objects under some description or classification. To see, or otherwise experience, a part of the world is always to see it as something, and this takes one beyond the immediately present and involves discernment and imagination. Perception is always informed by past experience, and it follows accordingly that when confronted with a section of reality, given the variance in their abilities and histories, different people see things differently. To one an earthwork, say, is a meaningless arrangement of stones; to another it is a megalith set against the background of the dawn. The first faces the same scene as the second but lacks the perceptivity to see the significance of this imposition of human order on nature, and to appreciate its aesthetic qualities.

At this point the sceptic may reply that we must distinguish between bare experience — the perception of colours and shapes etc., and the ways in which we interpret our observations. Interpretation may involve imagination and appreciation, but observation is essentially passive. This reply, however, is inadequate: all perception is enlightened, both by previous experience and by contemporary interpretation.

It is true that we may describe some experiences using the terminology of colours, sounds, etc., only, but such occasions are few: usually we bring to bear more sophisticated descriptions of our perceptions, and in so doing rely upon a whole battery of intellectual capacities ranging from imagination and associative thinking to value sensitivity. We are forever striving to achieve more appropriate accounts to capture better the nature of what is given in experience. Undoubtedly there is an important point to be made concerning the justification of applying one description rather than another, but there is no resolution of this general, epistemological problem outside of the attempt to form as accurate as possible
a picture of reality. Whether the issue is one of identifying shapes, or of forming an aesthetic judgment, one can only look, think, and confer with others to ascertain if our thoughts agree.

It is a naive fallacy to suppose that in the first instance something determinate is given to the mind via sensation; and consequently that reliable knowledge is only possible with respect to this. All understanding involves the work of the intellect in fashioning thoughts. In short, no area of understanding is guaranteed, but nor is any excluded, by the undeniable fact that we acquire knowledge through sense experience.

Having said this, let us approach the issue of religious experience by way of considering briefly another appreciative capacity, viz, moral sensitivity. Part of the sceptical empiricist's view is that since nothing given in experience (as he conceives of it), corresponds to moral and aesthetic judgments, these can be neither true nor false as such, but express preferences. Men claim a thing is good or beautiful if it pleases them or promises to satisfy a need. In this way morality, and any other system of values, is reduced to a set of means related to the achievement of man's prosperity.

Consider, however, how this misrepresents the character of moral judgment. We ordinarily take it that an act is virtuous, or a condition morally desirable, if it provides an example of a value which is in itself good. While the satisfaction of human need is correctly considered to be important, one may appreciate that it is not the source of value by reflecting on the fact that other considerations can outweigh this requirement. Prosperity matters: not because thereby men are made healthier, or are more contented, but because it creates conditions in which they are better able to concentrate on living in ways that are worthy.

Most thoughtful people are aware of the possibility that it may be morally necessary to forego the pursuit of well being. Yet this could not arise, if good and evil are reducible to the satisfaction of desire. Natural well being is one good among several, but to focus solely on it alone is to have a faulty vision of the source and nature of moral value.

It will be seen that we have developed a picture of perception in which two elements — the world and the subject - operate, experience being the product of their interaction. Seeing the world correctly involves more than opening one's eyes, it requires the exercise of appreciative judgment. Men can perceive material objects and can also discern in them the presence of value and disvalue; and on this basis they are able to develop an understanding of the world.
If one is prepared to accept that there are recognizable moral and aesthetic qualities — and to admit this is only to allow that the world is as most take it to be — then the issue may be raised as to whether it also manifests spiritual features. In sum, if one may validate various value judgments by appeal to the nature of reality as it is experienced by attentive subjects, may one not develop a justification of religious faith in much the same way?

To establish such a case at least two requirements need to be met. Firstly, we must give some account of the 'objects' of this kind of religious experience; and secondly, explain why there is not general and widespread agreement. In discussing both issues I shall be brief, since my aim is not to present a fully developed theory but to prompt further thought on an important topic.

When, in our earlier example, the two men viewed the stone circle and one experienced art dramatically juxtaposed with nature he saw things as they were, for he saw something of the aesthetic qualities of the object. Similarly, one may discover values in a painting, or reflect on a man's character and thereby recognize his virtues. It is possible, however, to remain blind to these aspects. Then the megalith remains a mound of stones; the painting a pattern of colours; the man merely an individual who behaves in a certain way. What this reveals is that in general value experiences do not involve special objects, but are rather responses to features of familiar items.

Thus we may suppose that some kinds of religious experience have the spiritual properties of ordinary, public objects or events. Further, continuing the parallel with other realms of value, these latter are likely to include actions and their products. It is possible to see in nature something of the dependency of the created on the sustaining activity of a Creator: but this is to appreciate the spiritual quality of an action, viz, the exercise of God's will.

More familiar, however, are experiences of human spirituality: one discerns in the lives of some men and women values of a kind that can best be described as religious, in so far as they transcend ordinary, moral virtues. Justice, integrity, courage and so on, belong to the ethical realm; but patience, understanding, love and selflessness, especially in the face of adversity, go beyond what is required for morality to a way of living that draws its sustenance from God's grace. It is first and foremost in observing others, therefore, that one detects the spiritual and the activity of God.

As regards the second challenge: that there is not general or common agreement on these matters, two points may be made. Firstly, it is the shared experience of mankind that the harder it is to discern truth, the greater is the degree of ignorance and disagree-
A multitude of reasons may be given to explain men's inability to discover the nature of reality. Some lack the necessary intellectual and appreciative capacities; others have not received an appropriate education, or have gone without advice and encouragement; still others have their vision clouded by desire, or are too preoccupied with other things to focus their attention properly. Indeed, ignorance is too familiar, and too common a feature of life to be used in an argument against the claim that men can recognize spiritual values. Besides, very many people do feel something of the spiritual character of the natural order, and are equally, if not more, responsive to such qualities when they encounter them in others.

A second difficulty appears to arise on account of the enormous variety of the forms of religious experience. In view of this undoubted fact, does not the support which faith might otherwise hope to derive from religious experience largely cancel out?

Certainly it is a fact that those of different religious cultures tend to interpret their experiences in terms familiar to them, and this may result in apparent conflict between believers. As before, however, this objection may be shown to be less telling than it at first appears.

Throughout we have been concerned with experience of the spiritual qualities of familiar objects, not with miraculous episodes, and this does not imply any particular theology. Rather it indicates the possibility that each of us can develop a higher self, more responsive to the need to embody spiritual values in our lives and to assist others to do likewise. This is consistent with a variety of beliefs. Moreover, when a conflict does arise, which is not simply one of interpretation, there is usually scope for further attention to, and reflection upon, the item in question, in the hope that by effort and goodwill disagreement may be resolved.

Reviewing the line of argument developed here, the question suggests itself: how may we come to enjoy this sort of experience? Once again the parallel with the appreciation of other values is worth pursuing. When one meets a man who is blind to the fact that a certain course of action would be vicious and unjust, one can only proceed by asking him to consider further the character of what he proposes. The aim is that he should see its true nature as something evil and to be eschewed.

In these efforts therefore, one is trying to lead him into the position of one who is morally perceptive, i.e., he should see things as would the truly virtuous man. Quite generally, however, if one wishes to acquire a skill that another possesses, the best way to go about it is to listen to what he says, and to watch how
he acts. In short, the surest guide to true vision and right conduct is example. If our goal is the discovery of truth then we would do well to follow those who clearly embody it in their lives (recall St Paul's reminder that behaviour is a measure of spirituality), and most can discern such virtue even when they believe themselves to be unable to emulate it.

Hence it is appropriate that in pursuing spiritual truth we should reflect upon the lives and teachings of the great Christian seers; but above all else we must study the words and example of Jesus Christ. Currently much scholarship is being addressed to Christological issues but, whatever this research produces it is clear beyond all doubt that Jesus calls us to a way of life in which one's vision is focused on spiritual values; whereby in seeing the natural order one sees throughout it the activity of God.

What I have been concerned to argue is that one familiar line of objection to the rationality of faith rests on a widespread assumption about the nature and scope of experience which is itself open to challenge. Further, once one appreciates that in understanding reality a variety of faculties are employed, and that these include sober, reflective, value perception, as well as scientific and logical analysis, one may claim with confidence that one's faith is justified both by the historical record and by contemporary religious experience.

REFERENCES AND NOTES

1 It will be apparent that the view outlined here is that developed by the British Empiricists, and that the particular version of it under attack is Humean in origin. See David Hume, Enquiries (Concerning Human Understanding and Concerning The Principles of Morals), ed. L.A. Selby-Bigge. (Oxford: Clarendon Press, 1902). The fact/value distinction as we have it today owes much of its inspiration to the sceptical empiricism of Hume and his followers. For a brief discussion of Hume's thought see: A.J. Ayer, *Hume*, (Oxford: OUP, 1980), especially Ch.5.

2 An interesting and popular attempt to present the content of historical Christianity in the light of these challenges is contained in D. Cupitt and P. Armstrong, *Who was Jesus?*, BBC, 1977).


6 A stimulating discussion of the moral and aesthetic dimensions of perception is to be found in I. Murdoch, The Sovereignty of Good, 1970.

7 Hopkins gives voice to this type of religious experience in his poetry. See, for example, "Pied Beauty":

"All things counter, original, spare, strange;
Whatever is fickle, freckled (who knows how?)
With swift, slow; sweet, sour; adazzle, dim;
He fathers-forth whose beauty is past change:
   Praise him."


9 I discuss how one may develop sensitivity to spiritual values through the study of great Christian art in "Religious Art and Religious Education", British Journal of Religious Education, 1982, 4(2), 64-68.

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In this paper Canon Wright seeks to examine man's inner experiences in so far as they help him in his search for God. In his use of the word "nature" in what follows he includes both the natural world around us and also man's own nature. He looks for objective elements within the subjective realm which can help man in his search.

I. God in the natural world

a. Intellectual conclusions. In a sense the purely intellectual level is not relevant to our subject, but it needs to be mentioned. The natural order with all its intricacies implies a creative mind behind it. Nowadays the fact of creation is often confused with the method of creation, and it is assumed that one must choose between evolution and God.

Nonetheless Paul's judgment of idolatry is still valid. Idolatry is untenable because 'all that may be known of God by men lies plain before their eyes; indeed God himself has disclosed it to them. His invisible attributes, that is to say his everlasting power and deity, have been visible, ever since the world began, to the eye of reason, in the things he has made'. (Rom. 1:19,20. NEB) A somewhat similar argument is the famous idol making passage in Isaiah 44:9-20.

This intellectual conclusion does not in itself lead us to the experience of God. It may start us on a search, or, if we are already believers, it may sound a chord in our hearts. 'The heavens declare the glory of God' (Ps. 19:1) is more likely on the lips of the believer than the unbeliever.

Nature taken alone as the way to God has sometimes led to strange results. Which is the reflection of God -- the spring sunshine or the tornado? So the Hindu pantheon includes Siva, the Destroyer. The nature religions, as typified by Canaanite
practices, involve a union between humans and anthropomorphic deities, so that the worshippers unite with the divine conflicts, deaths, resurrections, and sex experiences.

b. Feelings about nature. To many nature is just an inconsequential fact. We are reminded of the Peter Bell of whom Wordsworth wrote:

'In vain through every changeful year/Did nature lead him as before./A primrose by a river's brim/A yellow primrose was to him,/And it was nothing more.'

One of the finest books on the perception of nature is Sherwood Taylor's *The Fourfold Vision*. (1945). He speaks of

(1) Mere perception. The child finds itself in a world of shapes and colours. The adult may find no more than personal or practical significance in the world around. cf. Peter Bell's primrose.

(2) The scientific view of integration by knowledge. Harmony, relationship, and significance. e.g. Classification of the primrose.


(4) The intuition of God in nature. Sherwood Taylor speaks of this as "essentially religious, though not essentially Christian." "Some have the gift or grace of perceiving the relation of nature to God as directly and inescapably as the artist perceives beauty, while others, not thus gifted, may acquire the habit of rationally contemplating nature under this guise."

Wordsworth probably penetrated no further than (3). Although he was a believer, I cannot recollect any poem in which he finds the Christian God in nature. His longer poem, *Intimations of Immortality from Recollections of early Childhood*, speaks of the growing boy who comes "trailing clouds of glory... from God who is our home". Gradually shades of the prison house close upon him, while he "daily farther from the east must travel". The glory (of God?) in nature is fighting a losing battle.

We have already noticed one of the problems associated with the finding of God in nature. How do we face nature's ambivalence? William Blake gave it up in his "Tiger, tiger... Did He who made the lamb make thee?" Yet he found some comfort through the revelation of Isaiah 11, and his beautiful poem *NIGHT* has the lion guarding the lamb.
God, accepted through revelation and experience, can certainly illuminate nature, as in His great answer to Job and in the glory of Psalm 104. The latter draws upon the old Egyptian hymn to Aten, but the sun as creative lord has given place to Yahweh the Creator and Upholder.

To sum up, the aesthetic perception of the natural order is a valid approach to the deeper grasp of the material universe. It is highly, if not totally, subjective, but it can be communicated to others who are tuned in.

II. The Search for God within.

We turn now to human nature as possibly containing within itself the way to God. There is a way of linking nature without and nature within by an experience that has been well named Cosmic Consciousness. Perhaps not more than one person in fifty has had it, but all who have had it recognise the description when another speaks of it. I had the experience two or three times when I was younger, and someone who was doing a thesis on the subject at Oxford told me in a letter that it is unusual for an older person to have it for the first time. The experience comes suddenly and unsought, and probably lasts for no more than a second or two -- time becomes irrelevant. Rosalind Heywood in her contribution to the book *Life After Death* describes it; "Like a bullet the awareness struck me: physically the flowers and I were one, physically they and I and the trees and the grass and the soil in the garden -- and everything on earth -- were made of the earth, were part of it. And the earth was part of the solar system, and so on, right up to the whole universe. All, however diverse, was one. I did not think it; I experienced it." The last sentence is vital; one cannot think oneself into the experience at will. I would add the further strange feeling, accompanying the other, of everything being beyond good and evil, so that one knows that all is utterly and completely well.

It is no sense a religious or moral experience. It has no converting power. Thus H.G. Wells and Richard Jefferies experienced it and yet remained unbelievers.

A few days after writing this, I heard one of the early morning talks on the radio, in which the speaker dwelt on the sudden feeling of underlying glory in nature, in mountains, rivers, fields, and in the speaker's flash of insight when he suddenly noticed holly leaves in the rain. As I listened I realised a difference between this and the experience of Cosmic Consciousness. Like the speaker, one has had the perception that the glory is there, but, as he said, there is so much behind into which one cannot break through. In Cosmic Consciousness one actually does break through.
We turn now to some of the deliberate attempts to penetrate the restrictions of the conscious mind so as to experience a wider field beyond. Hallucinatory and psychodelic drugs were at one time used in the search for ultimate reality, or even God, but most serious investigators have abandoned the drug trail. It would not be unkind to say that many potential and actual addicts have found a better alternative in one of the forms of meditation. It is rare for these to be specifically Christian, and hence we may class them as belonging to the natural and experiential search for fuller light.

Their order of emergence over here, generally from the east by way of America, would probably be Vedanta (Huxley, Isherwood, Gerald Heard) including Yoga, followed by Zen Buddhism, and then the more popularised Divine Light, Transcendental Meditation, and the strange Hare Krishna movement. An independent movement, influential in certain circles, came from Indonesia and is known as Subud.

Here at last we can link up with something objective. Down the ages both Christian and eastern mysticism have occasionally produced observable and hence objective, phenomena. Fr. Thurston has written of levitations and other supernormal phenomena in his books The Physical Phenomena of Mysticism and Surprising Mystics. These phenomena have been accepted as bye-products of the mystical experience, although some easterners have cultivated them as desirable ends in themselves. Wiser practitioners have taken them in their stride if the experiences have come.

Modern science has adopted a different approach, and various types of electrical apparatus have been used to record brain waves, blood pressure, and metabolic changes when a person is meditating, and more particularly when he passes into a state of trance or near-trance.

Tests have shown increased Alpha rhythms in the brain -- a mark of rest; lowering of the metabolic rate, which means a slowing up of the life processes; a reduction in oxygen consumption and in cardiac output; and a decrease in the concentration of sodium lactate in the arteries. All of these physical states are connected with a decrease in anxiety. (Una Kroll, A Signpost for the World, p.60ff). In general this holds good for all deeper forms of meditation, but there are occasional differences. Thus, if there is a sudden noise, the records show that the Zen master hears it each time, and his alpha waves show it for a fraction of a second. The master of Yoga, on the other hand, does not register any awareness when the noise comes, or a flashing light, or even pricking with a pin. (Wm. Johnston, Silent Music, p.38ff.)
However, an objective excursion of this kind is of interest rather than of assistance in discovering the nature of mysticism, unless, as with the brain/mind controversy, we conclude that the ultimate reality is physical. On the assumption that the ultimate is more than this, we look more closely at its exploration via the inner world of man. We go into the shadows, but is there light at the end of the tunnel?

Paul's attitude at Athens makes a sensible beginning (Acts 17). He holds that God has implanted in mankind an instinct to "feel after him and find him" (v.27). Where the feeling has produced polytheistic idolatry, Paul's "spirit was provoked within him" (v.16). Where the feeling has ended in "an unknown God" (v.23) Paul finds hope. God is at least a desirable proposition, whoever or whatever He may be. He can be seen as the ground of man's being (v.27,28), but, if He is to be known, He is to be known personally in and through Jesus Christ, the objective and revealed reality (v.23b).

Where God emerges in non-Christian mystical experience (i.e. in the light of nature), He is either removed into a remote unknowable transcendence, or, more commonly, is seen as a permeating power, or is identified with the inner core of oneself. There may be an equation of the Atman (you) with the supreme Brahman so that your individuality is seen as illusion (Maya). Thus "Brahman is ever pure, ever free, self-luminous, and that Brahman is one's very self" (Swami Adhutananda's chapter in Vedanta for the Western World, p.127). The experiencer believes that he has a direct experience either of God or of his own expanded self. If God is there, He is not felt as the personal Father of the New Testament. Occasionally one meets a description which suggests a fuller revelation of God, and we dare not limit the grace of God in the search. Meanwhile we recognise an opening up of inner awareness towards a unifying of the self with an underlying reality. This has a side effect — some would judge the main effect — of an intense inner calm.

When we crash or slide through the gateway of normal consciousness, we may pass into the psychiatrist's daily bread of forgotten memories, repressions, and dynamic urges. As Jungians, we are entangled in the Collective Unconscious and its archetypes. We may release psychic powers, such as telepathy, clairvoyance, and astral projection. We may take the left hand path of the occult. Or we may keep to the road that leads to the mystic experience of restful oneness. This is what we want to assess.

Suppose we treat it as an awareness of the immanence of God. (Acts 17:28. "In him we live and move and have our being." Col. 1:17 "In him [Christ] all things hold together". Heb.1:3. "Uphold-
ing the universe by his word of power." The relation of God to the created order is not identical with that of the carpenter to his table. Certainly the universe is not God (pantheism), and it is no illusion that it appears a distinct entity. But it continues in being through the permeating energy of God. This energy sustains everything equally, since it would be absurd to hold that a human being, for example, needs more energy/life to sustain him (her) in existence than does a stone. One cannot say how far this upholding energy/life of God is linked to the belief of the physicist that there is no ultimate inertness in matter.

Can we speak of this upholding as impersonal? I think we must. It is difficult to imagine God as personally manipulating every atom in the universe all the time. An analogy might be the human body, the microcosm of the universe. In all essentials our bodies look after themselves. There is an upholding life/force that operates impersonally, seeing to our digestion, blood supply, endocrine glands etc. A wound sets in motion defensive and healing mechanisms. Yet we may intervene personally where necessary.

The Bible nowhere suggests that the way to the Father is through this life force. The Fall has left us with natural existence, derived from God's supporting power, but for the enjoyment of God we need to be reborn with the new life of the Spirit, giving the experience of Abba, Father.

If a person becomes aware of this life force, he will perceive it and experience it as the core of his existence, and also as the force that sustains the universe. He passes easily from self to non-self and to immersion in the whole. He passes beyond good and evil, since all alike partake of the same energy. He has, in fact, come deliberately into my unsought Cosmic Consciousness. God may, or may not, be seen in this Nirvana. If He is, His personality is suspect.

When a Christian meditates, he may use the non-Christian methods for stilling the mind. There are books on Christian Yoga and Zen Catholicism. There is the repetition of the Jesus Prayer. Posture and breathing and the use of certain objects play their part. One finds these means in Christian mystics down the ages. The Christian may latch on to the immanent life force, but, because he has the new eternal life in him, and is seeking God beyond an experience, he links the personal with the impersonal. The TM disciple is given a Sanskrit word by his guru. The word is intended to remain meaningless, but it has to be taken up to start each session of meditation. The TM teacher criticises Christian meditation on a Biblical theme or text, on the ground that he is still under the dominance of his thinking conscious mind. In fact the Christian naturally uses his mind and his commentaries to understand
the text, which comes as the revelation from God, or of God. In the meditation that follows he seeks to absorb the text or theme, and to be absorbed by it. In this way he is not swimming all the time in the pool of his own inner world. He tastes the freedom and glory of the ocean beyond.

Maybe this immanent life/force is also related to the inspiration of the arts. Inspired works have the link that makes the ordinary person, with ears to hear, feel moved in an inexplicable way from the depths. Several years ago I had an interesting experience of visiting an exhibition of psychotic art. Some of the pictures had the real thrill of inspiration, several of them being by patients who could paint only when they were under treatment and had lost the anchor of the ordered mind.

Finally, something might be said about the charismatic movement. It is difficult to bring this under the head of natural religion. Yet an observer must wonder whether all the manifestations are of the Holy Spirit. Tongues and prophecy are not products of the ordered consciousness, but some cases may emerge from the natural dynamism of the unconscious, or be induced by autohypnotism, or be explicable in Pavlovian terms, as they are by Wm. Sargant in *The Mind Possessed*. It is only since the experience became suggested and popularised that so many crave for it and achieve something significant. Like TM the experience brings inward peace. The new thing about today's outbursts is the private use of tongues in the personal times of prayer. Is it coincidence that the TM meditator uses an unknown Sanskrit word to release him? If we were following through the charismatic movement we should want to include Subud, which is a non-religious charismatic experience, offering experiences of release for the body and the tongue.

To sum up: nature without and within may give an experience which can be traced to the immanent life-upholding of God, but this experience is at an impersonal level. Who can tell how wonderful it would have been without the Fall? In the meantime it falls short of the New Testament invitation to fellowship with Father, Son, and Holy Spirit. While the deeper realms of mysticism are for some, the personal experience of God is for all, however simple.
This is a splendidly produced book and a work of fine scholarship, a worthy offering to the memory of Herbert Butterfield for the Jubilee of The Whig Interpretation of History. Butterfield's youthful essay, written in 1931, became a great seminal tract, which the author himself developed in The Englishman and his History, 1944. It has had an enormous influence on the philosophy of history and on this study of historiography. One of its most popular fruits is Professor J.H. Plumb's Pelican book The Death of the Past, 1969. But apart from the philosophical discussions about the nature of history in general and its place among the several modes of experience (to use Michael Oakeshott's phrase) and Popper's critique of 'historicism', a number of brilliant historians, many of whom have been closely connected with Cambridge, have examined in detail several great and influential historians to test the validity of Butterfield's strictures and to illustrate how they were expressing themselves, their ideals and anxieties, through the stories they told about the past. The 'Whig Historians' naturally claimed to be writing true stories about earlier people; but maybe they were more concerned with justifying their own tradition than with empathizing with different people in the past.

Among the historians who have been inspired by Butterfield, Dr J.W. Burrow is one of the most thorough, scholarly and interesting. It was to him that Professor Plumb dedicated The Death of the Past. Indeed, we are already indebted to Dr Burrow for Evolution and Society: A Study in Victorian Social Theory. Another closely related book produced in the same Cambridge group, and commended by Dr Burrow in The Times Literary Supplement, is Deborah Wormell's Sir John Seeley and the Uses of History. Not only was Seeley concerned with justifying the British Empire in The Expansion of Britain; he was very influential in religion with his Ecce Homo and Natural Religion. Dr Wormell's book ought to be studied and enjoyed as an essential companion volume to Dr Burrow's.

What was the fallacy which Butterfield castigated in his Whig Interpretation of History? Perhaps it is most clearly expressed in the comic work 1066 and All That, published by W.C. Sellar and R.J. Yeatman in 1930. The comic often does contain more wisdom
than some heavier and laboured serious writings. When these writers record an event they may say either "That was a Good Thing" or "That was a Bad Thing". But how does one decide which were Good Things and which were Bad Things? Butterfield treats this more systematically in the Whig Interpretation. If, for example, Charles I had won the Civil War, then the British Constitution would never have developed. That would have been a Bad Thing: therefore Cromwell's victory was a Good Thing. When a historian says this, he is talking about the British Constitution in his own day and admiring it. But assuming that Britain still exists and is not in a state of absolute anarchy, there will presumably be some governmental arrangements, some sort of 'constitution', though different from others which might have come into being. It is arbitrary, and even silly, to assume that there is one and one only arrangement rightly called the British Constitution and that History is providentially leading up to it. This implies also that when it has in fact been actualised, then it must be perpetuated at all costs; no changes can be permitted. 1066 and All That is specially wise at this point. After describing the results of the First World War, the authors write their last chapter, entitled 'A Bad Thing'. It consisted of one sentence: "America was thus clearly top nation, and History came to a ."

The 'Whig Historian' does seem to imply that history comes to a stop with our own noble selves. A.J. Toynbee once remarked, in relation to middle class liberals in western Europe, that we tend to think of our predecessors as just bogged down in history; we are in a position to take a God's eye view from outside history and thus see what the ancients were leading up to. Our use of the word 'normal' is also significant: when we are displeased with the state of affairs we start to wonder when 'things will get back to normal'. The period of history which we then absolutise will vary according to our tastes.

Professor Plumb distinguishes between 'The Past' and 'the past'. 'The Past' refers to our own traditions, covering our destiny and reinforcing our value judgments. 'The past' refers to what actually happened to past people and how they interpreted their problems. The modern scientific historian is concerned with what actually happened in the past; many of our cherished traditions may be destroyed by such scientific study.

The Whig interpretation of history does not belong to any one political or religious party. The great Victorian historians studied in detail by Dr Burrow would not have voted for the same candidates in parliamentary elections. He examines Macaulay the Whig, Stubbs the Tory, Freeman the Democrat and Froude the Protestant Imperialist. They were all searching the past to find justification for what they themselves admired — and in many cases what they feared to be threatened. It is not possible in a short review to summarize
any of these portraits, which are very subtle indeed. Though the
general reader will be stimulated by many penetrating 'asides',
this is, frankly, a work for professional scholars specialising in
that period. Your reviewer happens to have the *opera omnia* of
Macaulay, Froude and Seeley and some of Freeman. He often finds
himself checking up interesting remarks and then getting so fasci­
"ated that he spends a few hours reading Dr Burrow's 'sources'.
The reader needs a very great deal of background knowledge. This
book does, however, encourage him to try to acquire it.

There is a charming jacket illustration: the sculpture by
William Theed of Queen Victoria and Prince Albert in Saxon Dress.
This fits in with the historical philosophy of Freeman. The Anglo­
Saxons were our primal democrats! In their little villages they
got together in their moots and settled their affairs amicably.
This simple set of local government units shows a society in which
power and authority came from the grass roots upwards. It was dis­
turbed by the Norman Conquest which imposed a continental fuedalism
on the much more simple feudalism of the ancient English. This was
obviously a very Bad Thing. Freeman has very little sympathy for
the idea that the Conquest was a civilising mission that brought
Britain into Europe and introduced concepts of Roman civil and canon
law! The Reformation did a certain amount to undo this! It is
also interesting to see how the Whig Democrat historians were con­
cerned with how much the Romans left behind when they left England:
The 'Romanic' versus the 'Teutonic' theories about the origins of
Towns. It really was important that our origins should be as
English as possible. The Queen and her Consort wore Saxon Dress
in Theed's sculpture — NOT Roman dress. It was not irrelevant, of
course, that Victoria was a Hanoverian and Albert was a very earnest
German. Our Teutonic origins had to be emphasised. On the other
hand, it may have been poetic justice that Edward, oppressed by his
father, and always being compared unfavourably with cousin Wilhelm,
became strongly Francophile; thus caused a diplomatic revolution
and the Entente Cordiale. (According to *1066 and All That*, one of
the causes of the Great War was "German Governesses, a wave of whom
penetrated Kensington in King Edward's reign and openly said that
Germany ought to be top nation." )

Freeman was obviously against foreign conquerors: there is a
delightful passage quoted by Dr Burrow in full on page 196 about the
two Williams. The Conqueror and the Deliverer both visited Exeter;
William of Normandy was a Bad Thing; William of Orange a Good Thing.
They were both Conquerors, but the Dutchman was saving us from the
French and the Catholics!

The Norman Conquest, the Protestant Reformation and the Glorious
Revolution of 1688: these are the key points in our history. They
can be arranged in various ways to suit the political, religious and
cultural tastes of the historian; different aspects can be emphasised.
The writers were all concerned, however, with using history to justify themselves and their 'causes'. 'Providence' had always been busy leading to the consummation of the great British Enterprise - Victorian Imperialism. This triumphalism did not die out with Queen Victoria: I was taught in my own preparatory school by a devout history teacher that if the sun ever does set on the British Empire then the End is clearly at hand: not even God Himself could build a more glorious Empire on earth. We were taken round the mighty British Empire Exhibition at Wembley in order to reinforce this faith. The Royal Naval College nearby stimulated our interest in the naval histories of Callendar and Mahan and taught us how important it is for Britain always to rule the waves.

But in my next school a new fashion was developing. F.S. Marvin was replacing the British Imperialists and the League of Nations was to be God's last Great Throw. We gathered inside and outside St Martin's-in-the-Fields to welcome the several Peace Pacts which would phase out all arrogant nationalism and imperialism once for all, and Dick Sheppard was already preaching absolute pacifism. But even Marvin assumed that the infant League would need to learn virtually everything worthwhile from the great British Experience of justice, liberty and responsibility; it was far from accidental that throughout the 19th century the freedom fighters who fought for constitutional government against foreign dictators were almost always thinking in terms of the British Constitution. That seemed to be the standard (the 'Platonic Form' laid up in Heaven) by which all constitutions ought to be judged.

Why should this book be reviewed in a religious journal committed to the interpretation of Christian Revelation? The answer is that Church historians play much the same sort of game as the secular historians. This is obvious from the study of J.A. Froude in this book. The traditional Protestantism of the English Church was being challenged by the rising Anglo-Catholic movement. Were the Tractarians merely playing into the hands of the 'Italian Mission' when J.H. Newman wrote Tract XC to show that the 39 Articles could be interpreted so as to make them compatible with the dogmatic pronouncements of the Council of Trent? (cf. the passionate novels of Marie Coralli.) Were the English wrong as regards the Reformation? (J.A. Froude's commentary on the Letters of Erasmus are very revealing) When the Roman Catholics were allowed to set up their hierarchy again in 1850, Cardinal Wiseman, leaving Rome for London, expressed the hope that his native country would once again be the holiest jewel in Christendom, Queen Victoria was not amused: Rome could add nothing to the choiceness of her Church! The Cardinal needed to explain himself more clearly and deferentially before he could become persona grata.

The Protestant historians, of course, may also have been infected with 'Whig' fallacies. They also selected their stores about
the past very carefully. When Fox in the 16th century was writing the history of the Christian church, i.e. God's *Heilsgeschichte*, he wrote almost entirely about the Martyrs — i.e. those real Christians who opposed the medieval church. The reader gets the impression that from a Christian point of view the middle ages were almost entirely Dark Ages, God was biding His time until He raised up Martin Luther. The English Church, of course, reacted very wisely. Under the judicious guidance of Richard Hooker and Bishop Jewel, the English selected all that was really worthwhile in the traditions of the first six centuries, rejecting all the superstition, and thus became the bridge church between the warring Catholics and Protestants. The development of the British Empire made it possible for this version of Christianity to spread all over the world. This sort of Church history in its most triumphalist and simplistic popular versions shows that God Himself is really an Englishman at heart! But this sort of history is less valuable now that the British Empire is no more. In his book on *The Integrity of Anglicanism*, Professor Stephen Sykes of Durham has shown that the Anglicans can no longer justify their opinions on the assumption that these opinions have providentially come together; they must now be justified on their intrinsic theological merits.

But we need to go back even further than the English Experience. 'Whigishness' affects even Biblical historians, let alone the historians of the early Church. We often select from the Bible and other early documents those anecdotes which justify our own present position: we are not studying the past 'for its own sake'. When, for example, we talk about 'prophecies being fulfilled' we are often reading into the minds of the prophets ideas they almost certainly did not consciously have in mind. When the Christians encountered Jesus and accepted Him as Lord, they recognised Him as the expected Messiah and as the Suffering Servant of Isaiah. This may not have been what the Old Testament prophet was consciously talking about. The Jews select different stories and prophecies as the key points in Old Testament revelation. Maybe the Rabbinic commentators understand the Jewish mind better than later Gentile Christians. In any case, as the several Christian theological traditions have developed, the rival churches have built up their systems, getting further and further away from the civilisation in which Jesus and His rivals lived, committing more and more anachronisms in the process. There have been bitter controversies about the relations between Scripture and Tradition, especially after the Reformation. There is always the temptation to say "I stand by Scripture against your (mere) Traditions. But as Professor F.F. Bruce has shown, even the most exclusively Scripturalist Evangelical also has his traditions. We all read into the Scriptures our own traditional opinions and also seek answers to questions that nobody could have thought of asking in those days. We are all 'Whigs' really — at least to some extent. A good historian must try to recreate other people's experiences in
his imagination to understand them for their own sake and not simply for the sake of justifying his own beliefs and policies.

A.C. ADCOCK.
Manchester College, Oxford

REFERENCE

Maurice G. Tucker, Begin at the End, Vantage Press, 1982, 132 pp., $8.95

The author is a retired Anglican minister and his book is sub-titled 'An Essay in the Search for God in the Modern World'. The book is an attempt to look afresh at the Christian faith and its relevance to the modern world in the manner of an unprejudiced newcomer. The significance of the title lies in the importance of the 'End' of Jesus' life — his death and resurrection.

The book opens by drawing attention to the uniqueness of Jesus and the central importance of his rising from the dead. As a historian, the author accepts the historicity of the Gospels and tries to recapture something of the startling effect Jesus must have had on some of his contemporaries. He contrasts Christ's earthly roots in a unique nation, the Jews, with the necessary transcendence of God, whom Jesus claimed as his Father in an exclusive sense.

The writer then reviews briefly some of the apparent causes of modern scepticism deriving from evolutionary theories, scientific and technological progress, linguistic philosophy, Freudian psychology and some forms of biblical criticism. This chapter seems to me to be the least satisfactory, covering too wide a field in only ten pages.

The main value of the book lies in its continual insistence, from within an orthodox Christian framework, of the uniqueness of Christ and of his vital relevance to modern man with all his lofty pretensions and achievements.

The book is somewhat discursive, although not repetitious. It could be helpful to someone wanting a non-technical account of the main tenets of orthodox Christian belief.

There is a broad bibliography, with the conspicuous absence of books by scientists bearing on his theme; e.g., R.E.D. Clark, E.H. Coulson, E.K.V. Pearce.

A number of misprints was noted, none of them seriously marring comprehension.
Biblical Semantic Logic is not an easy book. It seeks to apply to the language used in the text of the Bible the analytical criteria of formal logic and meaning theory. In doing this, it brings together a variety of data from a number of distinct subject areas (theology, archaeology, linguistics, logic, philosophy, Near Eastern and Biblical studies); and though the author is clearly at east in this multi-disciplinary network of ideas, the non-specialist reader can perhaps be excused for not immediately grasping the full import of many of the book's valuable, but complex, findings.

But Biblical Semantic Logic is undoubtedly a book that repays careful study. It is firmly set in the pioneering mould of Professor James Barr's long-running campaign — notably in his Semantics of Biblical Language (1961) — to free the study of the Biblical text from the traditional, subjective, theological approach, and to assess it more objectively from the point of view of linguistic theory and within the orientalist context in which it was produced. While the author modestly describes the book as "a preliminary investigation", the publisher rightly calls it an "innovatory" study. Its concern, however, is not so much to break new ground at this stage, as to challenge much that has already been written and accepted. To that extent the book is controversial (and it is all the more lively and valuable for that).

For too long, it seems, acknowledged authorities have paid insufficient attention to the research findings of experts in disciplines contiguous to their own. Theologians have made statements about the Biblical text which logicians could not support (for example, R. Bultmann's comparison of John's Gospel with Gnostic texts, which is based on a misuse of the concepts of synonymy and identity — pp.53-4). Biblical scholars have developed interpretations of data based on a misclassification of archaeological texts (for example, W.F. Albright's view of the lack of 'logical reasoning' in the Hebrew Bible, which is based on the wrong assumption that the Old Testament and various Babylonian mathematical texts can be equated for analytical purposes — pp.225-231). Near Eastern linguists have often pursued their studies in ignorance of the requirements of semantic theory (for example, G.R. Driver's mistranslation, in the New English Bible, of Judges 1:14, where his rendering "broke wind" is based upon an untenable semantic leap between two similar words in different languages from separate epochs — pp.30-3).

The author's appeal is for consistency in interpretation of data in the text of the Bible. And since logic is, as we are informed, "the theory of consistency", the author's own method adheres strictly to the analytical procedures and topics of formal
logic. The bones of the book are the key to his approach: "Meaning", "Proper names", "Reference", "Roots", "Generality". These are the stuff of formal logic and language theory, and it is under these headings that Bible languages (and scholarly views of them) are considered in the book. But the author has been careful to illustrate all his theoretical points (and points of criticism) with concrete examples from the Scriptures, with the beneficial result that the careful reader has no excuse for losing sight of the practical implications for understanding what the Bible actually means. Indeed, any reader who might prefer to approach the book from the point of view of particular Bible passages or topics of special personal interest, rather than from the language theory angle, is well catered for by an "Index of Biblical passages" (there are well over 100 listed) and a comprehensive "Index of names and subjects" (12 pages of small type). These serve to lend the book an encyclopaedic, reference quality, and provide ready access to many detailed case-studies of special value (for example, the use of the Septuagint in O.T. interpretation – pp.104-110; Moses and the 'exposed child' motif – pp.144-150; and the importance of idiom in understanding levels of meaning – passim).

The book will certainly cause debate in learned circles, and it is well worth the informed layman's trouble to come to grips with what can truly be described as a wholly scientific approach to an area of study which has suffered from far too much wooly thinking hitherto.

REG CARR
University Library, Cambridge


This is a paperback reprint of a book that originally appeared in hardback in 1974. Its author is Professor of Religious Studies at Yale University, and his main aim is to trace the ways in which philosophical, psychological and historical theories influenced the interpretation of the Bible during the post-Enlightenment era, especially in Germany.

In the pre-critical era (exemplified mainly by Calvin and Luther), the Bible stories had been taken at face value as vehicles of revelation. The events they relate were assumed to be events that took place in the real world, which in turn was taken to be continuous with the world of the interpreter's own experience. But this kind of 'realistic reading' of the Bible has now been displaced by the notion that the 'truth' of Scripture is not enshrined in historical facts, but must be discovered in other philosophical contexts which may then be utilised to inform our reading of the
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Biblical stories. As a result, the foundation of modern hermeneutics is the supposition that the historical content of the Biblical narratives is more or less irrelevant to their true spiritual significance; the meaning of the stories was finally something different from the stories or depictions themselves, despite the fact that this is contrary to the character of a realistic story (p 11).

It is clear from that (and other statements throughout the book) that Prof. Frei is unhappy about using the Bible stories as nothing more than a convenient peg on which to hang modern philosophical garments. But is far from clear what he wants us to do about it. He writes of wanting to rehabilitate the 'realistic reading' of Bible narratives, but it is very difficult to see what he is proposing. On the one hand, he sees distinct advantages in the kind of commonsense reading of the Bible that characterised the pre-critical period. But on the other, he finds himself unable to make even a tentative identification of what he terms 'reality' in this context with any sort of historical truth claims. Unfortunately, he never attempts to answer the question that this raises: viz. how can one do this without falling into the same kind of theological mire as Schleiermacher et al.?

The fact that the book could be reissued in an unchanged form some six years after its first appearance perhaps implies that its author feels he has answered all the questions — and the sympathetic reader is left going over and over the book to try and find some answers. At the end of it all, one is left with the uneasy feeling that some of the answers may be there, if only one could cut through the turgid and verbose prose in which the book is written. This is perhaps Prof. Frei's greatest failing. For though one would wish to acknowledge quite freely that there is a good deal of helpful analysis in this work, surely it could all have been said in plain English and about half the space.

PROFESSOR JOHN W. DRANE

137 pp, PB (no price given)

The author traces the development of the prophetic tradition of Israel from its earliest stages to its completion with Jesus. This thematic approach is coupled with a critical view regarding the dating and authorship of many of the Old Testament books — especially the book of Job. However the unity of both Old and New Testaments is clearly demonstrated.

GRAHAM DOVE
Man is presented in this book as a questioner always seeking the answers to questions such as Why? What? How? When?. The author maintains that questions beginning with Why? are the most personal and most important questions we ask, and he leads us through these to the ultimate question: "What is the purpose of life?". This he answers by referring us to the life of Jesus who leads man from mystery of man himself to the mystery of God—so giving us a basis from which to answer all our questions.

GRAHAM DOVE


To those of us old enough to remember ardent 'Adventists' such as one who propagated his views by painting 'Behold I come quickly', across the front of his not all too speedy car, and another who, to her chagrin, sold his wife's fur coat because he was sure Christ was going to return before the winter, this book comes as an immense relief, the relief of being able to study the Scriptural basis for the Second Advent really sensibly without unchurching other Christians or making a fool of oneself.

For a Biblical survey of the Old and New Testament teaching about the Day of the Lord and the Last Things one need look no further than this up-to-date, scholarly and most comprehensive treatment of the subject. Indeed, it deals with more than just the subject of its title. The coming Kingdom, the crisis of judgment, the distinction between heaven and hell, the meaning of immortality, and what living in Christian hope can mean, all are more than adequately dealt with. Evangelicals in the past have held strange and extravagant views about these things, but the author shows how prophecies and forecasts, not always very clear, can be interpreted in a level-headed manner. Mr. Travis does not dodge problems. For instance, he shows how Old Testament prophecies could have several interpretations in different time-scales, "because each crisis in history, each act of deliverance, each judgment and each blessing in the experience of God's people" can have both an immediate and an ultimate significance.

This is particularly true, as the author points out, with the coming kingdom of God, explaining how in the Epistles it is the personal Lordship of Christ that fills the place given in Jesus' teaching to the kingdom.
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Readers of this JOURNAL will be particularly interested in what the author has to say (not a great deal) about how the Second Coming of Jesus can be visualised in the context of scientific forecasts about the end of the world. He claims that as we recognise the creation story in the Bible to be more concerned with the purpose than with the exact manner of its coming about, the same principle can apply in the Christian understanding of how the 'new heavens and new earth' are likely to come into being. That there will be a triumphant finale to all human history is the Christian's blessed hope, and sad is the man who cannot look forward to this. The author's quotation from Emil Brunner sums up the importance of this theme: "A faith in Christ without the expectation of a Parousia is like a flight of stairs that leads nowhere, but ends in the void." - H.E. Hopkins


Mr. White's second volume surpasses the first not only in length, but in quality. In the first volume (reviewed in this JOURNAL 107, 147) he surveyed the Biblical material. Here he continues the story from the post-apostolic period to the present. From its inception the Christian Church made a decisive moral impact on a decadent pagan world and came face to face with the unprecedented problems of wealth, slavery and the Church's relationship to the State. In addition it sought to uphold the sanctity of marriage and the family when this was virtually abandoned. The history of Christian ethics has been to a greater or lesser extent concerned with these problems ever since. It is interesting to trace through this book the various responses to such issues. The early Church renounced wealth but Clement of Alexandria allowed riches if they benefited his poorer neighbours (shades of John Rawls?). Similarly we can observe the development of the concept of the just war in Ambrose, Augustine and Aquinas from an earlier pacifism and its fruition in Calvin's justification of the execution of heretics on the grounds that the State ought to protect true religion.

White places the Christian moral apologists in their historical context, treats them sympathetically and quotes extensively from original documents. He rightly corrects the mistaken view of the Puritans and stresses the value, as well as the short-comings, of movements like monasticism and mysticism. It is also pleasing to find a chapter devoted to Erasmus whose Christian contribution is generally undervalued. If there is lack of sympathy it is with the Calvinists, whose religious standpoint virtually destroys any
possibility of moral responsibility and with the modern situationist ethics which seem to justify anything in the name of love.

There is a tremendous amount in this book that is worth quoting but space forbids. Although the books grew out of lectures prepared for B.D. students their value goes far beyond such narrow confines. We, like the early Christians, are faced with new unprecedented moral issues thrown up by the development of science. The advent of the atomic bomb, contraception, genetic engineering and their attendant problems call us to examine afresh our Christian response. Principal White has shown how evangelical Christians have throughout the centuries been foremost in ethical concern. We too should not shirk our responsibility in this regard. Reading this book will not solve the problems but might well set us on the road to a solution.

R. LUHMAN


There is no shortage of introductions to the New Testament and another needs to be justified. This book was first published in 1970 and is now reprinted as a paperback. Its distinctive value is that it assumes no knowledge of the New Testament and thus can be put into the hands of a young Christian.

The opening chapter deals with the historical background, taking in the Inter-Testamental and the Roman periods. Subsequent introductory chapters deal with the secular and religious background, explaining in simple terms the pagan and Jewish religious concepts and institutions and the text and canon.

The main body of the book is a simplified introduction and commentary on the whole of the New Testament. The reader is encouraged to read the New Testament for himself and is prompted to further study by a series of questions at the end of each chapter. These questions make the book eminently suitable for group study.

The book is easy to read with marginal headings, summaries of each book and with the Gospel story treated harmonistically as a consecutive narrative. It has numerous charts, maps and photographs which are unfortunately in monochrome and not always clear. Although it is not a scholar's book it is well documented and therefore should encourage the interested reader to go deeper.

R. LUHMAN
The Victoria Institute was founded in 1865 to promote investigation of the relation between science and the Christian faith, at a time when many people believed science to be an enemy of revealed religion and irreconcilable with it.

During the hundred years and more since then, the climate of thought has changed. Older problems have been resolved, new problems have arisen, and, above all, thinking Christians have realised the need to develop a world-view that welcomes new ideas and can incorporate new knowledge. The Institute has played an important part in these changes.

Since its foundation the Society has broadened its field of interest to include all intellectual disciplines that have a bearing on religion. Recent papers have dealt with archaeology, history, psychology, medicine, law, education, philosophy, sociology, and biblical studies, as well as the natural sciences.

With the ever increasing rate of advance in all disciplines, the need is greater than ever for an institution in and through which new developments relevant to Christian faith can be brought to the notice of Christians, and their implications discussed. The Victoria Institute, in attempting to play this role, aims at being constructive and forward-looking, and not merely defensive.

The Institute does not represent any particular denomination or theological tradition. Its policy rests upon the belief that the nearest approach to truth is likely to be achieved if a broad spectrum of views is considered.

The most important function of the Society is the publication three times a year of a journal, FAITH AND THOUGHT, which contains papers, book reviews, and short notices of current events and ideas. The papers include presentation of original work, and reviews of trends in broad fields. The Journal is sent free to all Fellows, Members, and Associates.

Meetings are held, regularly in London and occasionally in provincial university towns, for the presentation and discussion of papers. Some of the meetings take the form of a whole-day symposium.

The Institute administers trust funds, the interest on which is used annually to award a prize for an outstanding paper in a particular field published in the Journal during the preceding three years, encouragement being given, where appropriate, to younger members of the Institute.

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