# Faith
## and
## Thought

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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.

## 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 respect-
ively.

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 (F & T, 1980,107(3),167),had undertaken the responsi-
bility 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 substan-
tial loss of income.    It was hoped that the amendments to the Con-
stitution 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 $10^4$ 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 $3\frac{1}{2}$ x $\frac{1}{2}$ 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 X̄P̄N̄ (*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 expan-
sions 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 unex-
plained 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. HEMER


                          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,

(to which modern chemists have added hydroxyl radicals and super-
oxides) 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 discov-
ered 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 is 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 conflic-
ting 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 $3\frac{1}{2}\%$ of the national need for elec-
tricity 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 indus-
try) 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 extre-
mely 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 con-
siderable 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 finan-
cial 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 acci-
dent 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

dams.   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 extrac-
ted, 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 a 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, separa-
tion 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 *chaoite*.   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 220nm 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 Wickramasinghe 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 dis-
credited.   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".
(Paul Davies, "Something for Nothing", *New Scientist*, 27 May 1982)


## 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 assis-
tance 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 oppositive extremes) think of abortion in terms of
murder.   Peter Cousins (e.g. in *The Harvester*, May 1981, p.12) use-
fully 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, how-
ever 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 $3^{\circ}$ 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 $1^{\circ}$ 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 discov-
ered.   (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 inven-
ted 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 wit-
nessed 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 govern-
ment 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 Eisley'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) evan-
gelical 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 exam-
ining 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 Jly 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 prin-
ciple 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)

ROBERT L.F. BOYD, FRS

CREATION OF THE COSMOS

PART 1 - SPACE AND TIME

"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 millenia 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 consc-
iousness 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

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(1826).    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 sur-
face of an average star.    Not only would this mean that the sky
would not be dark at night, it would imply an intolerable and obvi-
ously 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 dist-
ances 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 profu-
sion 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 galax-
ies 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 famil-
iar phenomenon.    For light as for sound if the distance between an
observer and a source is decreasing rapidly the frequency is increa-
sed, 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) rela-
tively 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 infinit-
esimal.    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)

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

*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 celest-
ial '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 diff-
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 expan-
ding 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 con-
tains 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 "burn-
ing" 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
acquired 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 rota-
tion, 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 evol-
utionary 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 en-
gulfs 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 ener-
getic 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 radiowaves 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 Uni-
verse 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 Testa-
ment 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 cosmolo-
gists 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 con-
vey 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

(Revelation 1.8).    In fact the word $a\overset{.}{i}on$ 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 respon-
sibility 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 impreg-
nates 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 persevering 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 celes-
tial 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 pre-
cisely 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 understan-
ding 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 in-
definitely, 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 cer-
tainly 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-
ining 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 every-
thing.    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 x $10^{16}$ (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 x $10^{16}$ — that we have already noted, we cannot expect, even if we could master the techno-logy, 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 proper-ties of space which shows it every bit as "real" as more tangible matter, but we must get back to the bigger scale, broader relation-ship 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 Ein-stein'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.

GORDON CLARKE

# DOES ARTIFICIAL INTELLIGENCE
# THREATEN GENUINE FAITH?

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?"[1]   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 illu-
minate 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 com-
pared 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

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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 com-
puter 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 con-
sciousness 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 intel-
ligence 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[1] 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 pro- grams 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[2,3,4] — 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.

(iii)     The memory system of the brain is far more sophisti-
          cated than computer memory — it is distributed, so
          patterns can successfully be rebuilt from part
          information.

(iv)      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.

(v)       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,[5] 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, distri-
buted 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[6] 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 net-
work 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 intel-
ligently to us, regardless of whether the intelligence is achieved
by the same processes as the brain uses.[3a]   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 investi-
gated 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,[5a] 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,[3b,5b] 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.[7]    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.[5c]

*(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 pos-sibilities 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 solu-tions, so that inappropriate ones are quickly rejected and the best is located without wasted effort.[3c,8]    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 intel-ligent 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.[9a]

    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.[3d]    All the time refer-
ence must be made to a vast stock of information concerning syntax,
grammar and the relationships between concepts.    In 1950, Alan
Turing[10] 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,[11] (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.[9]

*(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[13] in the early 70's.    His novel departure
was to regard language, meaning, knowledge and reasoning as inte-
grated parts of human thinking rather than entirely separate proces-
ses.    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.[9b]

    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,[5d,12b]
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 instruc-
tions without external intervention in response to information
gathered from the environment.   G.J. Sussmann[4a,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 parti-
cular computer language developed by Sussmann et al for its imple-
mentation.[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.[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 des-
cribed 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.[14,16,17]

Programs which provide a natural-language interface for inter-
rogation of business databases are now commercially available and
despite high cost, have attracted a healthy number of customers,
indicating their genuine usefulness.[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.[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 intel-
ligent robots that can "move about the place without crashing through
the window or trampling on the cat".[9e]

There have been a number of developments in computer-aided
teaching and learning which owe a lot to AI research.[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.[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 astro-
nomy and the microscope to biology".[3e]    AI has given us a new set
of 'mental tools'[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.[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, program-
ming methodology and personal computing may blossom too[16,17] but we
are far from the 'Ultra-Intelligent Machines' which have been pre-
dicted by some to be the salvation of humanity from bureaucratic

chaos and our lack of competance to deal with the complexity of our own affairs.[18a]   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.[3f,9g] 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.[19]   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*.[4c] 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.[9h]    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 inter-
preted 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 pro-
grammer's thinking.[9i]     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 mean-
ing 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[20]
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;[9h]  certainly no more so
than they were 30 years ago,[1] 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'.[42]    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 prin-
ciple to correlating all mental events with brain processes.[4d,21a]
All mental events, that is, from the point of view of an external
observer.    That brings us to the second problem — that of our sub-
jective 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?[9j]    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.[3g,6b,22a]

       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.[3h]
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.[23]    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.[6c]    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[20]
later in time    the principle would not be violated.    It is diffi-
cult 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 knwon as 'epiphenomenalism'.    It is associ-
ated with T.H. Huxley, and is held (implicitly or explicitly) by
quite a number of scientists.[6d]    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 exis-
tence of the totally non-functional mental 'danglers'.[21b]    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 experi-
ments of Roger Sperry on individuals who have undergone 'split-
brain' surgery for the relief of epilepsy, for exampe, may possibly
imply that the two halves of the brain can exhibit separate conscious-
ness.[6e]    Taking this to be so, Sperry suggests that 'mind is an
emergent property of cerebral excitation'.[6f]    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*.[25]    Eccles takes a specifically interactionist position,
and attempts to locate the mechanism by which mind and brain influ-
ence 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'.[22b]

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'[24] of Schopenhauer where the material world was a by-product of mind, to the 'materialism' of Hobbes, where mind was reduced to matter.[3i] In modern times, the antithesis between idealism and materialism is reflected in the phenomenological vs. behaviourist schools of psychology.[3i]   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.[6g]   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'[23] 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[21] and by Place,[26] 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.[27]

Identity theory has a lot to say about the first problem I distinguished at the beginning of this section, namely the relation- ship 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.[28]   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 dis- charge' which is not an identity statement because it's not symmetri- cal 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*[23] 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 deduc-
ing 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.[4e]

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.[28]   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.[9k]   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.[3j]   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.[29]   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 *logi-
cally* 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* opera-
tion, 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 trans-
cend 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 traver-
sed 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 bet-
ween 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 signifi-
cant 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 impos-
sible 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[6h] 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[5g] "It is usual to have the polite convention
that everyone thinks".   Nevertheless for a wide-ranging conversa-
tional machine which passes the Turing test, there is no under-
standing without intelligence i.e. rational thought·in the human
sense. [91]   The problem is whether such intelligence could be gener-
ated 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 adaping 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 programm-
ing is external, and any strategic adaptation is only there because
someone has programmed it to be.[18b]   For machines to develop intel-
ligence 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.[34]   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 heros 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.[4f]


## 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.

(i) *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 auto-
matically 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.[1]    Christians argue for the freedom and responsi-
bility of men's *minds* before God, not their *brains*, for it is people
who think, not brains.[4g]    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 limita-
tions 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 deriv-
able 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.[38a]    Clearly,
for the whole human being to survive death requires a trancendent
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 hard-
ware, however, invites speculation about the re-embodying of the
logical structure of a personality.[1,4h]    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[38b] 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.[39]

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 dependant 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 pre-
dict, 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 plan-
ners 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 intel-
ligent 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 turnout 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.[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.[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 meorable sentence
"A Christianity free from the wateful necessity to defend its little
strip of the mind's territory can appear more brave, more convinc-
ing, 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 com-
patible 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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JOHN J. HALDANE


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 empiri-
cist assumption. Understand-
ing 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', respective-
ly. 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 impor-
tance 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 quali-
ties comparable to perception of physical objects.  They are there-
fore taken to be expressions of sentiment and desire arising from
human needs.[1]

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.[2]  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 express-
ions 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 spirit-
ual.  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 pro-
gramme 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 un-
assailable.  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 re-
course to the miraculous is most often found among those whose out-
look 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 exper-
ience 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 un-
compromising version of the *tabula rasa* account of the mind, accord-
ing 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 real-
ity, given the variance in their abilities and histories, different
people see things differently  To one an earthwork, say, is a mean-
ingless 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 essen-
tially 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[3] 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, epistemol-
ogical 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 con-
sequently 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 guaran-
teed, 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 exper-
ience 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.[4]

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 con-
siderations 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 con-
centrate on living in ways that are worthy.

Most thoughtful people are aware of the possibility that it may
be morally necessary to foresake the pursuit of well being.   Yet
this could not arise, if good and evil are reducible to the satis-
faction 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, exper-
ience 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[5];
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.[6] 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.[7]

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-

ment.  A multitude of reasons may be given to explain men's inability
to discover the nature of reality.  Some lack the necessary intellec-
tual and appreciative capacities; others have not received an appro-
priate education, or have gone without advice and encouragement;
still others have their vision clouded by desire, or are too pre-
occupied 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 un-
doubted 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 cul-
tures 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 developing 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 some-
thing 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 spiritua-
lity),[8] 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;[9] 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 understan-
ding reality a variety of faculties are employed, and that these
include sober, refective, 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 deve-
     loped 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 empiri-
     cism 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).
3    On the relevance of imagination to discerning religious truth
     see:   M. Warnock, "Imagination — Aesthetic and Religious",
     *Theology*, 1980, 83, (November).

4    For recent challenges to the attempt to mark a fact/value
     distinction along the lines indicated here see:  D. Wiggins,
     "Truth, Invention, and The Meaning of Life", *Proceedings of The
     British Academy*, 1976, 62, and H. Putnam, *Reason Truth and
     History*, (CUP, 1982), Chs 6 & 9.
5    On this view of ethics see:  F. Dunlop, *"The Objectivity of
     Values"*, *Downside Review* 1981, 99, (No.335, April).
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."
     G.M. Hopkins, *The Major Poems*, Dent, 1979.
8    Ephesians 4:23-24.
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.

**\*\*\*\*\*\*\*\*\*\***

J. STAFFORD WRIGHT

THE LIGHT OF NATURE

> 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 intellec-
tual level is not relevant to our subject, but it needs to be men-
tioned.   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

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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.

(3) The comprehension of the artist.  Aesthetic perception. Poets, painters, musicians.

(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 unknow-
able 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 Adbhutananda'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 revel-
ation 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 conscious-
ness, 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 enjoy-
ment 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 medita-
tion 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 inspira-
tion 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 exper-
ience 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 move-
ment.  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 exper-
iences 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.

ESSAY REVIEW — A.C. ADCOCK


# BURROW'S *LIBERAL DESCENT*


This is a splendidly produced book[1] 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 histor-
ians, 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 interest-
ing.    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 com-
mended 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 speci-
ally 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 des-
troyed 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 fascin-
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 Enter-
prise — 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 Peave 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 commit-
ted 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 pro-
nouncements 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 reveal-
ing)    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 hoicest
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 infec-
ted 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 tradi-
tions 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 pos-
sible 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 under-
stand 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

J.W. Burrow, *A Liberal Descent: Victorian Historians and the
English Past*, Cambridge University Press, 1981, £19.50.

★★★★★★★★★★★★★★★★★★★★★

# REVIEWS

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 exclu-
sive 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 psy-
chology 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.

<div align="right">D.A. BURGESS</div>

Arthur Gibson, *Biblical Semantic Logic*, Blackwell, 1981,
244 pp., £12.00

*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 Profes-
sor 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 insuf-
ficient 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 analyti-
cal 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:    "Mean-
ing", "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.

<div align="right">

REG CARR
University Library, Cambridge

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    Hans W. Frei, *The Eclipse of Biblical Narrative*, New Haven:
    Yale University Press, 1980


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-Englightenment 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

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 sumpathetic 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


John Baker, *The Prophetic Line*, The Saint Andrew Press, 1980 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

Ralph Morton, *Knowing Man*, The Saint Andrew Press, 1980,
170 pp, PB, £2.50


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.

<div align="right">GRAHAM DOVE</div>


Stephen H. Travis, *I believe in the Second Coming of Jesus*,
Hodder & Stoughton, 1982, (252 pp), £5.50


To those of us old enough to remeber 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
chargin, 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 Christ-
ians 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 treat-
ment 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.

    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


        R.E.O. White, *The Changing Continuity of Christian Ethics,
        Vol 2:  The Insights of History*, Paternoster Press, 1981,
        442 pp., PB, £8.60


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
renunciated 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 forbis.   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 now 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


Robert H. Gundry, *A Survey of the New Testament*, Paternoster
Press, 1979, 400 pp, PB, £6.00


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 intro-
ductory 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 com-
mentary 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

or Philosophical Society of Great Britain

29 Queen Street, London, EC4R 1BH.

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.

Membership

(a) *Fellowship* of the Institute is open to applicants who are professing
Christians and who have been nominated by an existing Fellow.  Fellows have
the right of nominating candidates for election as Officers and Council
members.

(b) *Membership* is open to all, whether Christians or not, who are interested
in the relation of faith to thought.

(c) *Associateship* is open to *bona fide* full-time students below the age of
25 years;  and to full-time Christian workers who, because of a small income,
cannot afford the Fellowship or Membership subscription.  Associates do not
have voting rights.

(d) *Library Associateship* is available to Institutions desiring to receive
the Journal regularly.

# THE VICTORIA INSTITUTE

or

## THE PHILOSOPHICAL SOCIETY OF GREAT BRITAIN

### FOUNDED 1865

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