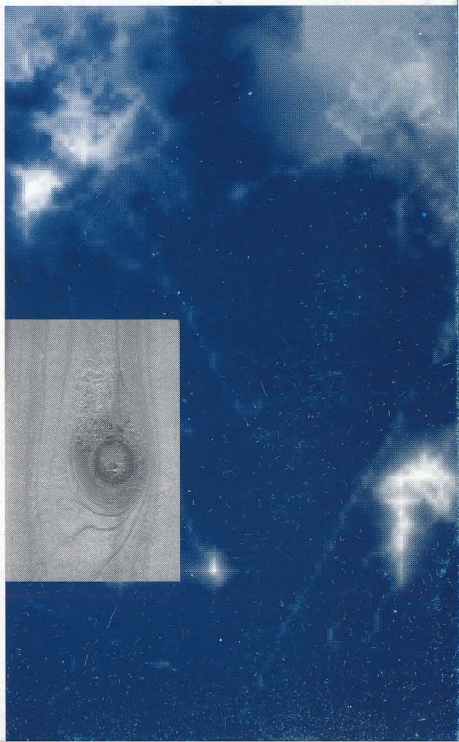
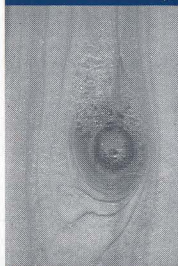




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Contents

	page
Editorial	2
Christian Implications of the Human Genome Project Jacqueline Engel (Prize Essay Winner)	2
Book Reviews	18
Cumulative Index to Vols 71 - 100 (1939 - 1973) M - Z	20
The Victoria Institute - Application for Enrolment	31

Editorial

It is a particular pleasure to publish in this issue the essay which won the recent competition (*Faith and Thought Bulletin* 29, April 2001). Jacqueline graduated in Cell Biology and Genetics from the University of Birmingham, and is now working for an MA in Medical Ethics and Law at King's College, London. It is hoped that she will be free to attend the Institute's Annual Meeting on May 13 this year, and receive her award there. It seems appropriate that Dr. Caroline Berry, our guest speaker then, is addressing a very similar subject.

We continue to publish more of the cumulative index in this issue.

Christian Implications of the Human Genome Project

J. Engel

1. Introduction

Humans today have the opportunity to understand themselves at a level that would not even have been contemplated two thousand years ago. Once the belief in a 'god' of some description was the presupposition of every society, and people largely understood their existence in light of their faith in something beyond. We now live in an age that largely dispenses with such 'foolishness', so instead we look to ourselves for an explanation about our existence. Modernity held out the hope that scientific discovery would answer such questions, and enable us to solve our problems in the process. There are those within society who still put their faith in such scientific discovery. Others sense that the 'scientific revolution' has failed and are left to seek elsewhere for an understanding of

human existence and hope for the future. Many have stopped asking the 'big questions' about human existence altogether.

The modern western world entering into a new millennium consists of a huge spectrum of beliefs and coping-mechanisms for life. A plethora of '-isms' exist to which one may assign knowingly or unknowingly. The rise within society of eastern religious mysticism indicates the search for something other than 'just this'. A few still hold on to a personal knowable God in whom answers and explanations may be found. If the world is a stage, it is a very interesting one for the Human Genome Project to make his grand entrance into. Just what part will he play in this unfolding drama? What answers will he offer to the questions we have? Who on the stage remains interested enough to fully comprehend what he is doing?

This essay will not, I am afraid, contain comprehensive answers to the many questions that may be asked about the Human Genome Project. In this drama of life a lot is contained within the 'remains to be seen' bracket. Rather I shall seek to consider some of the implications that the Human Genome Project could have upon our society, and the questions that Christians may need to consider in this changing environment.

2. The Historical Development of the Human Genome Project

The Human Genome Project (HGP) is an international initiative with the ultimate aim of mapping (obtaining a complete description of) the human Deoxyribose Nucleic Acid (DNA) sequence. It was born out of many years of research and experimentation by scientists across the world, dating back to 1953, when the structure of DNA was initially described by James Watson and Francis Crick¹. DNA molecules contain the basic information needed for life. Within each human cell there are 46 chromosomes (22 paired autosomes and two sex chromosomes) and each chromosome is made up of a long length of DNA wound up and packaged into a compact form. This packaging dramatically reduces the 'size' of the DNA; it is estimated that a single human cell contains 1m of DNA¹. Within this DNA the instructions needed to make proteins, the building blocks of life, are contained. It is estimated that only 5% of our DNA actually codes for protein, the rest is termed 'junk' DNA but may have functions that we don't yet understand. The 5% of functional DNA codes for approximately 80,000 proteins; thus it contains 80,000 genes.³

Mapping of the human genome began with research into genetic diseases, as scientists were able to identify specific genes in association with certain familial disorders and to locate these genes within the human genome. The first international workshop dedicated to human gene mapping was held in 1973 at Yale University, and the pooling of information at that time allowed the mapping

4 FAITH AND THOUGHT

of a total 25 human genes². These meetings were then held every two years, such that an international body of scientists were working together to map human genes long before the HGP was officially formed. It wasn't until 1991 that the US Federal Government finally gave official approval to a US human genome project and funded it with an estimated three billion US dollars. The project was scheduled to run for fifteen years. Following this event, pressure from researchers in other countries led to funding initiatives in Europe, Japan and Russia. This is therefore a truly international project, although the overall coordination is based at sites in the USA and UK.

At the initiation of the US HGP, the following goals were set for the first five years³:

- Construction of a high resolution genetic map of the human genome
- Production of a variety of physical maps of all human chromosomes, and of the DNA of selected model organisms, with emphasis on maps that make the DNA accessible to investigators for further analysis.
- Determination of the complete sequence of human DNA and of the DNA of selected model organisms.
- Development of capabilities for collecting, storing, distributing and analysing the data produced.
- Creation of appropriate technologies to achieve these objectives.

By 1993 progress towards achieving these goals was on schedule or in some cases even ahead of schedule, and technological advances were dramatically changing the shape of the project so that a new five year plan for 1993-1998 was developed⁴.

In 1998 all of the major goals in this plan had been achieved and a new plan was set for 1998-2003, which included finishing the complete human DNA sequence by 2003, two years ahead of the original schedule⁵. New initiatives of the HGP include:

- Mapping the major sequence variations in human genes and increase understanding of how these relate to multigenic traits and phenotypic variation.
- Methylation analysis of the human genome. This will provide further information of human variation and tissue specific genetic activity so that medical therapies can be designed on a more 'individual' basis.
- A Cancer Genome Project to identify somatically acquired sequence variants and mutations, and hence identify genes that are critical in the development of human cancers. This will then enable detection of germline mutations in non-neoplastic human genetic diseases through genome-wide mutation detection approaches.

These new developments are built on the groundwork that has been laid through the primary sequencing and mapping of the genome. Once the HGP is officially 'finished' there will still be plenty of research to do. It could be argued that only now, as it is coming nearer to completion, is the really interesting work beginning; the task of understanding *how* our genes actually work together to produce the complex organism.

At the outset of the HGP significant funding was also set aside for research into the 'Ethical, Legal and Social Implications' (ELSI) of the work. ELSI has its own extensive goals set for examining the wider issues raised by this new information and technology⁵. One of these is to "Increase the number of scholars who are knowledgeable in both genomic and genetic sciences and in ethics, law, or the social sciences." ELSI consider that the increased pace of genetic discoveries requires specially trained individuals to study the social impact of these discoveries. This may be an especially important area of knowledge for Christians to aspire to; perhaps we have a special responsibility to understand, and speak about, the implications that this science will have on society.

Scientists are primarily driven by a desire to know and to push forward the boundaries of knowledge as far as possible. By careful experimental investigation the scientist seeks to understand why the universe is as it is and works how it does. This is the fundamental nature of scientific discovery and on its own is innocently amoral. For a Christian, understanding the intricacies of creation is a good thing if it leads us to greater awe at the mind of the Creator. However, science does not happen in isolation, and in the current technological age the general rule is that a scientific discovery will result in some technical application. Furthermore, there are philosophical questions thrown up by many of these new discoveries about the world in which we live.

The repercussions of the HGP are far reaching. As stated by the directors themselves, "The Human Genome Project is fulfilling its promise as the single most important project in biology and the biomedical sciences - one that will permanently change biology and medicine."⁵ Many of these applications are highly beneficial both to individuals and society as a whole. However, there are also difficult ethical questions raised by these developments. Within this essay the applications of the HGP within the medical arena and the further reaching consequences of these into society, and philosophical debates related to our 'genetic' selves are considered. There are also considerable issues raised by genetic technology in the areas of plant breeding, cloning and xenotransplantation which are not considered in this essay. For the Christian whose beliefs are already contrary to much in modern society, these technological and philosophical applications create a new forum for ethical and theological discussion.

3. Applications of the Human Genome Project

The HGP enables us to understand disease processes at a fundamental level. For many congenital malformations we can identify a causative genetic abnormality. Similarly for certain cancers a specific genetic cause, or genetic pre disposing factors, are known. Genetic research is searching for predisposing genes for heart disease, high blood pressure, certain psychiatric disorders and even alcoholism. By analysing the genetic makeup of an individual we seek to ascertain what diseases he may develop. As the HGP develops and specific genetic defects for disease are discovered, research is moving into the study of genetic 'predisposition' for multigene disorders and other human characteristics. A lot of this is still in the speculative stages and there are no clear correlations between genes and the more variable human characteristics.

The largest application of genetic technology in current medical practice is for the prevention of inherited genetic disorders. When the genetic cause of a disease is known, an individual's DNA can be studied for the presence of the specific gene mutation. This can be done at three levels: carrier screening of prospective parents, pre-implantation screening of prospective embryos (as a part of IVF treatment), or pre-natal screening of foetal DNA.

Inherited genetic disorder can be categorised into two groups (for simplicity in this essay, the picture is actually more complicated for many syndromes), recessive and dominant. A human cell contains two copies of any given gene (except those on the sex chromosomes, for males), one inherited from the mother and one from the father. If a genetic disorder is described as dominant it requires only one of these copies to be 'damaged' in some way for disease to be caused. Other disorders are recessive such that disease is only caused if both copies of the gene are damaged. Therefore a human can carry within their DNA a damaged gene but suffer no ill effects of this as the other copy of the gene can compensate for the loss. This person is described as a 'carrier' for that disorder and there is a 50% probability that they will pass the damaged gene onto any of their offspring. Mostly people remain happily oblivious to the fact that they are carrying genetic mutations and passing them onto their children. Problems only arise when two carriers have children together as any child has a 25% probability of inheriting two damaged genes, one from each parent, and will thus suffer the consequent genetic disorder.

Carrier Screening

There is a higher risk of children being born with recessive genetic disease when people marry within a 'family' as the two individuals will share a proportion of their DNA, having inherited it from a common ancestor two or more generations before. Some recessive disorders occur at a high rate within specific populations:

β -thalassaemia in Cypriots and Pakistanis, Tay-Sachs syndrome in Ashkenazi Jews, Cystic Fibrosis in Northern Europeans. For such 'high risk' populations there is the possibility of carrier screening whereby individuals are tested for the gene and, if found to be a carrier, can be advised about their reproductive options. Carrier-carrier couples may opt to have no children at all, or can have any potential children 'screened' for disease.

An interesting example of this population screening is seen among a community of Orthodox Jews in New York City⁶. A screening policy was adopted by this community to test teenagers in high school for Tay-Sachs carrier status and subsequently to discourage dating between couples who are both carriers. The information regarding carrier status is recorded at a central office and before embarking on a relationship couples are encouraged to check their risk of having children with the disorder. In the first ten years of the project "at least 67 couples who were considering marriage ... decided against it after being advised of their risk".

Pre-implantation testing

Parents who are at risk of having a child with a genetic disease have the further options of pre-implantation and prenatal diagnosis open to them. Pre-implantation diagnosis involves in-vitro fertilisation of the egg and sperm from the parents and cultivation of the fertilised egg to the eight cell stage at which point one or two cells can be removed from the blastocyst without damaging it, and used for DNA testing. For many this is ethically and emotionally preferable to prenatal diagnosis as it removes the option of abortion if the embryo is found to have a disorder. However, it has other ethical implications. Laboratory fertilisation involves the creation of a number of embryos from which some will be chosen for implantation into the mother's womb. Of those not chosen some may have the genetic disorder being tested for while others may be perfectly healthy but unfortunate 'extras'. For genetic disorders that are sex-linked, such as Duchenne Muscular Dystrophy, embryos for implantation can be chosen on the basis of their sex; probability indicates that 50% of those not chosen because they are the wrong sex will actually be perfectly healthy. As Christians what is our attitude to this selection of embryos? And what about those that are not chosen? Do we consider them as valuable, potential lives or are they merely a collection of 'spare' cells with no real relevance or value? If that is all they are why not use them for experimentation?

Pre-natal diagnosis

Pre-natal diagnosis can be carried out for a larger spectrum of disorders, not all of which need to be tested for genetically. The implication of pre-natal diagnosis may be beneficial in that it can enable the attending physicians to prepare for the

birth of a child that may need immediate medical care, and the parents to prepare themselves psychologically for the baby. There are also, however, many other implications which Christians and indeed others in society are concerned about. Termination of pregnancy is an option for a woman whose unborn child is diagnosed with a disorder. This option has resulted in the phenomenon of 'tentative pregnancy'⁷. Parents will have less commitment to their unborn child in the earlier stages of pregnancy, waiting instead until they have had all the relevant tests done to ensure that it is healthy. This emotional distancing allows a pregnant woman to retain the option of 'walking away' from the baby. Gilbert Meilander questions this distancing, "Perhaps the time of pregnancy will be better spent learning to love the child we have been given, before we evaluate and assess what our child is capable of ..."⁸. This attitude assumes however a belief in the 'givenness' of children that many in our society do not necessarily hold.

Treating Disease with Gene Therapy

For many genetic diseases the HGP is holding out the prospect of gene therapy to treat the disease, although the actual methods by which this may be done are complicated and not yet well developed. It is hoped that as techniques improve the genetic material of an affected individual will be manipulated to overcome the defect caused by mutation, this may be done in two ways. Treatment may be carried out after birth in order to alleviate the symptoms of disease. The foreign genetic material will only be present in the individual treated and will not be passed on to any children they may have, this is somatic cell therapy. This method is preferred by many as it does not permanently 'alter' the human gene pool. However, it also leaves the possibility that the person may pass on the genetic disorder to their own children, who will then themselves require therapy. Another option is germ cell therapy. This involves changing the genetic makeup of the individual at the earliest stages of development so that new genetic material is added to either replace or overcome the faulty DNA. Many are cautious about this type of therapy as the 'extra' material will be inherited by any children the individual may have and therefore be permanently present in the human gene pool. However, this also has benefits in 'treating' the familial genetic disorder for future generations.

Cancer Diagnosis and Predisposition

Another application of human genetics is in the realm of cancer studies, and seeking to investigate the role of genetics in development of different cancers. There are some tumours and cancer syndromes that are linked to very specific genetic mutations: retinoblastoma, Von Hippel Lindau disease, Li-Fraumeni syndrome and a collection of other familial cancers are linked to specific genes known as tumour suppressor (TS) genes. Loss or damage of one of these genes

does not result in tumour development but leaves the individual who has inherited the genetic defect susceptible to cancer as they are at risk of losing the other gene through various mechanisms.

Cancers also develop sporadically through spontaneous mutation of an individual's DNA, which may be caused by environmental factors (exposure to UV light, certain chemicals etc.) or merely as part of the ageing process. Study of the human genome suggest that there are susceptibility factors to cancer; a certain genetic variation may not definitely result in cancer development but leave the individual susceptible to cancer with other factors (environmental and genetic) either increasing or decreasing the likelihood of tumour development. Similar genetic predispositions are predicted for other human disorders such as diabetes, hypertension, coronary artery disease and schizophrenia.

The HGP has expanded its aims to include identification of genes involved in cancer development, and the major variations within the human genome which may be factors in the development of various diseases. Research into these predisposing genes may enable us to predict an individual's susceptibility to various traits.

4. The Wider Implications to Society

What are the implications for Christians of these methods by which we, as humans, may avoid and cure genetic disease? Carrier screening of parents appears to be a preferable method to pre-implantation and pre-natal diagnosis as it avoids the ethical issues related to spare embryos and abortion. The screening program adopted among the New York Jewish population promotes a responsible attitude among those screened and helps avoid an untreatable and debilitating disorder. The success of the program has led to it being extended to include cystic fibrosis and Gaucher's disease. Many would question this extension as cystic fibrosis is treatable and the symptoms of Gaucher's disease do not appear before age forty-five⁸. Is it acceptable to discriminate against these less debilitating disorders, and if we do are we on a 'slippery slope' towards eliminating other undesirable traits? At present, large scale population screening is impractical, but with the improvements in technology may come a more realistic option in the future. What if we could screen widely for genetic diseases and somehow 'manage' people so that they only have children with someone who is genetically compatible?

All of these technologies and options concerning childbirth have a hint of eliminating 'bad' traits. Obviously illness is an undesirable thing and something that the whole medical profession is geared up to alleviate, treat and prevent. But foetal screening is the only form of medicine in which doctors offer to treat a condition by eliminating the patient (or prospective patient)⁹. As the HGP is

set to complete the human DNA sequence within the next two years and to develop a comprehensive database of disease related genes, there will be an increasing number of human disorders which can be tested for. Currently women may opt for abortion if the unborn baby is shown to have a cleft palate, a disease that varies in its severity but can be repaired by surgical procedures and which many would argue is not serious enough to warrant abortion. With increasing knowledge there are many similarly less serious genetic disorders which we may be able to test for. How will we decide where to draw the line?

It is possible that we won't, and there may be a gradual eroding of acceptable boundaries until anything that can be tested for will be tested for, and prospective parents will find themselves faced with an unprecedented choice about the child they are planning to have. A world can be conceived of in which all will be given the option of selecting the 'best' embryo from a number of viable ones, selecting for desirable traits rather than only seeking to avoid debilitating genetic diseases. Maybe one day we will even be able to engineer embryos to introduce desirable traits that don't naturally 'run in the family'. All of this seems very far fetched at the moment, but is it inconceivable? Furthermore, if reproductive technology does reach such a point, what will be the response of prospective Christian parents?

Creation of a genetic underclass

Let us imagine a society in which testing unborn children for genetic traits is a widespread phenomenon in order to avoid genetic disease, and predisposition to undesirable traits such as heart disease, diabetes, schizophrenia and depression. Knowledge and technology has reached a point where a standard test can be offered to all prospective parents, and the procedure for implanting healthy embryos is always successful. This is standard procedure. If parents do not comply with this they may be viewed as bad parents for not giving their child the best possible start in life. They also leave their child in a 'genetic underclass' in which life insurance will be higher and job prospects worse. As a Christian within this society a person may fundamentally disagree with the principle of selecting embryos in this way, yet the pressure to comply with the normal, accepted mode of action may be great.

Similarly a simple test using modern technologies could be performed on every individual to determine all the predisposing variations lying within their DNA. Life insurance brokers might ask for such a test, as might prospective employers. The analyst may take into account other factors such as environment, fitness, whether or not a person smokes or eats high cholesterol foods, they may have a intricate equation that weighs up all the relevant factors to determine how 'risky' the individual is. People may find themselves being discriminated against for reasons beyond their control, their bad genetic inheritance. Surely we would never go

that far? These ideas seem extreme, but it is worth our considering as Christians the lengths to which society may go and decide beforehand how we believe we should act within that.

5. Healing and Wholeness

The medical applications of the HGP offer hope to many who suffer with illness and disease. The woman with a mother, aunt and sister who have all developed breast cancer will live with feelings of anxiety knowing that this may also happen to her and maybe to her daughters. Genetic testing within the family enables in many cases for more definitive information to be given; if she is found not to have the predisposing mutation she is relieved of the burden (although she still has the same risk of developing breast cancer as any woman in society). If she is found to carry the mutation extra care can be given to ensure that any tumours are identified early and thus hopefully treated more effectively. In rare cases women with such a genetic mutation opt for preventative double mastectomy (an extreme measure, the necessity of which is questioned by many) as a reassurance that she will not develop the cancer herself.

For parents who know they are at risk of having a child with a severe genetic illness the advances made through the HGP offer hope for overcoming that, and having a healthy baby. For those in desperate need of a new heart, liver, kidneys, the advances in organ transplantation techniques and xenotransplantation, which depend upon the knowledge of genes and immunity gleaned through the HGP, there is hope for faster and better treatment.

The information and technology available because of the HGP has speeded up the rate at which new scientific discoveries are made. In 1980 it took five years of work to locate the gene causing Cystic Fibrosis in a family. By 1999 these timespans were reduced to nine days when searching for a gene causing Parkinson's disease within a single family¹⁰. Such advances are resulting in a rapid increase in our knowledge of human genetic disease processes, and this in turn promotes the development of better therapies for disease. In the example of Parkinson's the research cited above led to identification of a gene, α -synuclein, which if mutated causes the neuron death and associated degeneration that characterises Parkinson's disease. Mutation of α -synuclein is a rare cause of Parkinson's disease, but it is part of a common pathway that was not known about before this genetic information was available. Knowledge of this pathway initiated new ideas for therapies to treat the disease.

Physical healing for broken humanity is a fundamental aspect of Christian belief. The Hebrew Scriptures reveal a God who hears and heals his people, caring intimately for their spiritual and physical wellbeing. To Abraham he is El-Shaddai, the God who nurtures, nourishes supplies and satisfies, being all-sufficient and all-bountiful, and ultimately bringing forth a child from an old and barren couple¹¹.

In David's Psalms we frequently see a God who interacts and heals ("O Lord my God, I called to you for help and you healed me." Psalm 30 v 2). He restored Hezekiah to health and extended his life by a further fifteen years ("I have heard your prayer and seen your tears and I will heal you" 2 Kings 20 v 5). Then in Isaiah 61, 'The Year of the Lord's Favour' is proclaimed, with a prophetic vision of a time when captives will be freed, mourners comforted, the broken hearts bound up. Jesus claims this responsibility for himself when he stands in the temple and reads this scripture, announcing that it is fulfilled through him. The three years of his ministry are then filled with accounts of his healing people of various afflictions ("Jesus went through Galilee, teaching in their synagogues, preaching the good news of the kingdom, and healing every disease and sickness among the people." Matthew 4 v 23).

The HGP has many beneficial implications in the area of healing disease and as such is something Christians can embrace. But it has other implications that we should question, and therefore presents a paradox of responsibilities. We must respond in love to the woman who is at high risk of having a severely debilitated child, and yet we may find ourselves disagreeing with the procedures she is employing to overcome that problem. Furthermore, healing humanity at the genetic level somehow goes 'deeper' than the medical treatment of other ailments. A secular psychologist has said, "I believe there will be a 'holistic psychology' in the not too distant future, like holistic medicine, (that) integrates scientifically based treatment approaches with alternative, more spiritually based modalities"¹². While we may be concerned that the spirituality referred to here is not Christ-centred, we may still consider the benefits of a holistic approach to disease. Does the HGP offer such a holistic approach? Or does it rather, by understanding and treating (or removing) human disease at the fundamental level, distance us further from consideration of our spirituality?

6. Rights and Duties

The assertion of individual human rights within society is a common and highly acceptable phenomenon. Human rights are legislated for and form a basis on which many build their morality. Health is considered by many as a fundamental human right, along with the healthcare necessary to promote health. With the developments of the HGP personal genetic health may also become a right, and certainly the individual's right to have a healthy child is already part of medical practice. Personal rights and autonomy are an incredibly important concept to most people in society. But this often results in conflicts of rights, and as a society full of autonomous beings the result is a collection of people trying to fight for their personal rights against each other. If a right exists, there is a corresponding duty of respect for that right. Duties however can exist without corresponding rights. As Christians it may be better to consider society in terms

of duties. Our faith is founded on a man who never sought to assert his human rights but rather gave up everything, even the most basic human right to life. Instead He lived a life of responsibility and duty, to His Father and to fulfil His purposes on earth. Maybe as Christians we should let this sense of duty, rather than right, mould our responses to the HGP and its implications to our society.

7. Financing and resource allocation

A large amount of money is spent on the HGP. It could be suggested that this money would be put to better use solving other societal problems. It is humbling to draw back from the issues relating to our genetic discoveries and take a good look at the world as a whole. How much do the people of Afghanistan, living for years under the tyranny of the Taliban care about DNA and genetic predisposition? For them each day is a battle to survive, and life would be made considerably more bearable by having the basic necessities provided for. What significance do the ethics of reproductive technology have to the thousands living in shanty towns on the outskirts of Bombay? Of what help is research into a rare genetic disorder to those who die in Africa each year of Malaria and Diarrhoea?

In the West we have the privilege of having our basic needs met and material benefits beyond what we need. We have the time, money and inclination to explore the intricacies of our biological makeup, to delve the mysteries of human disease, and thus to consider how we might relieve our society of many ills. This is not a bad thing, but we would do well to step back and consider our responsibilities within the global community. Jesus came for the sick, the poor and the needy. He spent time with the lowest members of society and as Christians we are urged to do the same, we are encouraged to care for those that society doesn't. As Christians should we have a more 'radical' view of our Western privileges? Should we view the HGP with a doubtful eye, not because of the ethical implications that it produces, but because it embodies the arrogance of a people seeking to rid themselves of minor diseases before they would lift their brother out of a terrible situation they could prevent?

8. Philosophical Questions

God revealed through his creation

Genesis reveals a God who is actively and progressively involved in creation. Romans 1 v 20 declares, "... since the creation of the world God's invisible qualities - his eternal power and divine nature - have been clearly seen, being understood from what has been made, so that men are without excuse." As humans we are set into this creation with the unique ability to explore and understand it, to question the logic that governs it and our place within it; only we are set to turn on ourselves and wonder why we are here. The Bible clearly states that God is revealed through his creation, and therefore the exploration of our world should

lead us into ever greater understanding and awe of the creator. The HGP is a good thing if it causes people to marvel in this way.

However, the Bible also indicated that many are set to not realise this, in 2 Corinthians 4 v 4 "... the god of this age has blinded the minds of unbelievers ..." and in Psalm 14 v 1 "The fool says in his heart, 'There is no God'." As unbelievers delve further into the intricacies of creation and yet remain unmoved by God's revelation of himself through it, are they removing themselves further from him and rejecting the Spirit's work (Mark 3 v 29)? Does this continual rejection of revelation signify a hardening of their hearts (Psalm 95 v 8)? John Wyatt has described bioethics as a 'playground for philosophers'⁹, which indeed it appears to be. The scientific exploration of our world has paved the way for many new discussions and theories about human life and meaning. The arguments put forward are very persuasive and knowledgeable, being the products of incredible intellectual minds. Christians can find it difficult to defend themselves and their beliefs against the onslaught of these theories, especially as they gain increasing prevalence and respect within society.

As Christians how can we defend ourselves against these philosophies? How can we equip others, both within and outside of the scientific community? How can we stand for truth in the eyes of a non-believing world and help those within society who may otherwise be taken captive by these philosophies? Colossians 2 v 8 warns, "See to it that no-one takes you captive through hollow and deceptive philosophy, which depends on human tradition and the basic principles of this world rather than on Christ." We have a responsibility to understand these other theories and arguments and be able to give a reason for *our* hope in the face of them (1 Peter 3 v 15). Similarly we need to encourage one another in this, and especially in terms of teaching and equipping younger Christians who are entering this field of work and study.

Richard Dawkins and scientific reductionism

For a fuller discussion of science and religion, and particularly the arguments of Richard Dawkins, I refer the reader to some very useful articles by Mike Poole^{13, 14, 15}.

Scientific reductionism seeks to understand something at its most fundamental level. As a scientific method for research it involves reducing things to their component parts and is a useful, theologically benign technique. Dawkins describes himself as a 'hierarchical reductionist' who merely sets out to explain the complex entity at a particular level within the hierarchy of complex organisation¹⁶. However, as Michael Poole points out¹⁵, this automatically leads Dawkins into ontological reductionism; since he believes that the natural world is all that there is it can only be explained in terms of its smallest components. Taken to its conclusion reductionism implies that, "... religion is just psychology,

psychology is basically biology, biology is the chemistry of large molecules, whose atoms obey the law of physics, which will ultimately account for everything!"¹⁵. Thus humans are reduced to mere atoms and DNA molecules and it is through these that we may understand our place in the world, our purpose and meaning.

The arguments put forth by Dawkins are very well known and respected within society, so that many may accept them without really questioning the validity of his claims. This is accentuated by the popular belief that science and religion are incompatible, that science has disproved God, that all serious scientists are atheists, a belief which is largely mistaken and yet propounded by the media's representation of such issues¹⁴. A recent Channel 4 series, 'Testing God', gave a clear and fair picture of many of the issues within the 'science and religion' debate with input from prominent professionals on each side. Yet its conclusion seemed to imply that though science hasn't disproved God, it has caused us (and the program focused predominantly on the Christian concept of God) to reassess our understanding of him. Somehow God was reduced to a creator who set the process in motion (with the big bang) and then stood back to let nature take its course. This assumption was made not in an attempt to reconcile the creation/evolution debate but rather to alleviate the age old problem of suffering for believers in a God of love and omnipotence; God's love was not questioned, rather the assertion of his power in our world.

Genetics enables us to understand our existence at the most basic level, and the big bang offers a scientific explanation for the beginning of the world. Put together these two scientific advances reduce humanity to atoms and chemicals, collections of particles which are here by chance - the product of years of evolutionary processes. These ideas, when taken as the only truth concerning our existence, are contradictory to the Christian concept of a personal God who created and is involved in His creation. This does not mean we should shy away from the scientific theories. As Christians we should be able to embrace all truth. If our faith is true, if it has reason and content, then although it may be shaken it will not fall. Rather, through testing, it may be proved to be stronger, more reasonable, and more contentious than ever.

9. Conclusion

The Human Genome Project is a brilliant advance in scientific knowledge and technology. The knowledge of how we biologically function should create a sense of awe at the mind that could create and hold together such a complex organism. We can understand disease processes as never before and this enables ever better methods for treatment and prevention of such ailments. However with knowledge comes responsibility, and the HGP entails an enormous responsibility because of the far reaching applications it may have within society. The HGP can play a twofold role in healing the sick and in promoting thought

among people about the big questions concerning human meaning and existence. It may also be capable of leading people into fundamentally wrong actions and philosophies. As Christians within this ever changing environment we have a duty to stand for truth and justice, to tend to the neediest within society and ultimately to proclaim the Good News of Jesus Christ. We may have to accept that we cannot impose our ethical stance upon a society that does not hold the same beliefs as we do. But this does not mean that we should withdraw from it. Rather we must be informed and thoughtful about these relevant issues, and ready to respond in love.

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Book Reviews

John Wilkinson

The Medical History of the Reformers: Luther, Calvin and Knox

Edinburgh: The Handsel Press, 2001. 119pp. pb. £9.95. ISBN 1-871828-60-0

Reviewed by Ruth Gouldbourne

It is all too easy to think of those who are heroes of the faith as being mainly or entirely minds and spirits, and to forget that they are and were people with bodies like the rest of us. In this study, Wilkinson helps to redress that unbalanced assumption. Using autobiographical material from letters and extracts of writing, and putting that together with his diagnostic techniques; he conducts a thorough examination of his three "patients", and presents us with a fascinating and compelling account of the various - quite normal - illnesses from which they suffered. He even comes to conclusions about the causes of their deaths. All of these men seem to have suffered from kidney stones and constipation, from gout and insomnia. Bronchitis, pneumonia and cardiac disease are also among the conditions described.

The medical detective work is fascinating - a type of jigsaw history, in which a skilled researcher is able to take small and apparently meaningless comments or throw-away lines in people's writings, and build up a picture which gives us a convincing representation of the physical experience of these men.

Wilkinson also engages with some of those who have attempted to write biographies of these reformation leaders - and is not unwilling to point out the places where unwarranted assumptions about the physical, mental or emotional state of the subjects have been drawn. As he shows, some of the critical or hostile conclusions that some have drawn about these men are based on a misunderstanding or a lack of knowledge about their physical conditions, and on medical knowledge and speech of the time.

Each essay was originally published individually, and although they have been rewritten to be put together in this book, there are places where the joins show and unnecessary repetition of facts or conclusions are evident. It would also have been helpful of the writer had included a glossary, or some description of the maladies he is describing for those readers, like me, who have little or no knowledge of the meaning of complaints like kidney stones or bronchitis. The book by no means assumes a significant medical knowledge, but the assumption of even less would have been helpful.

The book does not assume any historical knowledge beyond the fact that these three men lived and were part of the Reformation. By putting them in a historical context, we are better able to understand the import of the medical conclusions

that are drawn. There is little attempt to draw links between the medical conditions and the theology which each produced, and while such reticence may well be advisable, especially in the light of some of the weirder conclusions which have in the past been drawn, it would have been interesting if, for example, in a short concluding chapter, some consideration might have been given to such reflections. Wilkinson does however clearly demonstrate the importance of the living faith which each man had, the devotion with which each served, and the challenge which each therefore offers.

This is a very readable study about a fascinating topic, and one which reminds us that the people whose thoughts and theology we treasure were clay pots like the rest of us.

Ruth Gouldbourne is Tutor in Church History and Doctrine at Bristol Baptist College.

Stephen Hodge
The Dead Sea Scrolls

London: Paitkus Books, 2001, 234 pp, hb, £16.99. ISBN 0-7499-2165-X
Reviewed by Ernest Lucas

Since the fiftieth anniversary of the discovery of the Dead Sea Scrolls in 1997 there has been a spate of publications about them, much of it at quite a technical level. This is a book aimed at the general public and intended to give a general overview of the field of Dead Sea Scroll studies or 'Qumranology'. The author is a specialist in comparative religion but says that he has followed the story of the scrolls with keen interest. He rightly says that many of the books on the subject are written to support one particular theory or another. Since he has no personal stake as a scholar in the field he feels that he can provide a balanced presentation of the different views in the current debate.

The book is in four parts. The first tells the story of the discovery of the scrolls and the sorry story of the process of editing and publishing them. Hodge rightly explodes the 'conspiracy' theories which grew up around the lengthy delays in publication, explaining how they were the result of incompetent organisation and the scholarly possessiveness about new discoveries and their publication that arises from the desire to gain maximum 'kudos' from it.

Part II provides a clear and readable survey of the history of the Jews from the time of the exile in Babylon (586 BCE) to the Bar-Kokhba revolt (135 CE). This provides the historical background needed to understand the debate about the scrolls and community at Qumran.

The third part of the book explains the methods used in the attempts to date the scrolls and then goes on to discuss the contents of the scrolls collection in some

detail. In this section the reader begins to become aware of some of the areas of disagreement and debate among Qumranologists. This leads into Part IV, which surveys the scholarly debate about 'Who wrote the scrolls?'. Hodge discusses answers, ranging from the majority consensus view that they were written by a group of Essenes who had withdrawn from mainstream Jewish society to live in the desert at Qumran while awaiting the Messiah, to the bizarre view of Dr. Barbara Thiering that John the Baptist is the 'Teacher of Righteousness' spoken of in the scrolls and Jesus of Nazareth the 'Wicked Priest' who persecuted him! On the whole the different theories are presented fairly, with some judicious comments about their strengths and weaknesses. Hodge seems a bit too impressed by Dr. Norman Golb's argument that the buildings at Qumran were a fortified military post and so could not be the home of a religious group. Golb did not carry out any comparison with other fortified sites of that era. Those who have done so argue that Qumran rates as a 'fortified farm' rather than a 'military post'. There is nothing odd about religious settlement having the nature of a fortified farm given its isolated position.

The weakest part of the book is the final chapter. Here Hodge seems to be straining to find points of similarity between the Qumran community and the early Jewish Christians, despite the possibility that many of these may simply result from both groups sharing a common Jewish heritage. To be fair, he does note significant differences also. He gives too much credence to the very sceptical outlook of the 'Jesus seminar' scholars with regard to the reliability of the Gospel records of Jesus' sayings. They do not represent the mainstream of New Testament scholarship on the subject. He is right to stress the value of the scrolls in improving our understanding of Judaism in the time of Jesus.

There are a handful of 'typos', which for some reason concentrate on page 27.

Overall, this book can be recommended as a good, readable survey of the current state of knowledge and debate about the Dead Sea Scrolls and the Qumran community which does not presuppose any prior knowledge of the subject.

Ernest Lucas is Vice-Principal and Tutor in Biblical Studies, Bristol Baptist College.

Patrick Johnstone and Jason Mandryk

Operation World

Paternoster Press, 2001, 820 pp., pb, £12.99. ISBN 1-85078-357-8

Reviewed by A.B. Robins (Editor)

This book was received for review in early September 2001, shortly after the shattering events in New York and Washington. It was understandable therefore that I turned to Afghanistan to read about this particular country. I found very revealing information there, much of which has since become more public

knowledge, but I was grateful to be well-primed before this. Every country in the world is to be found in these pages, with information on history, geography, demography, religion, and all to be used for guidance in prayer. To that end, future needs are spelled out, not least in the challenges which are faced by Christians there. The book contains many lists - world leaders, web-site addresses, etc. There is also a CD-ROM available.

My only reservation is in the list of Mission Agencies, which seems somewhat selective. I realise that the ethos of the operation is evangelical, but as an Anglican I was disappointed to find that CMS and SAMS were mentioned, but no reference to USPG, now 300 years in the mission field. Moreover, where is the Methodist church mentioned? Is mission limited to evangelicals? I think not.

Cumulative Index Part 3

The first part of this index was published in Bulletin 27 (April 2000) and covers volumes 1 to 43 (1866 to 1912); Part 2 (Bulletin 28) volumes 44 to 70 (1912 to 1938); Part 3 which follows (now much fuller than the previous indices) covers volumes 71 to 100 (1939 to 1973).

Abbreviations

Asterisk (*) - the first page of an article; **c** - correspondence; **d** - contribution to a discussion; **f** - and pages following (used sparingly; **frw** indicates that a further review by the same writer in the pages ahead); **n** - note; **ob** - obituary; **r** - review; **rw** - writer of a review.

Volume numbers are in **bold type**. In volumes 95 to 98 the paging in each separate issue starts again at page 1. In these volumes the issue numbers are indicated by parentheses. Thus **95 (2) 16** indicates page 16 of volume 95 part 2. Where a paper is followed by discussion and the discussion does not immediately follow after the paper, the page at which it starts is given by the number which immediately follows. Thus **85 35* 107d** indicates that the article referred to starts on page 35 of volume 85 and that the discussion starts on page 107 with other matter intervening. If the discussion is in the following volume this is stated.

To save space titles of papers and headings are indexed under key words and (with a few exceptions) not given in full.

**Journal of the Transactions of The Victoria Institute,
continued (after Vol. 90) as Faith and Thought.**

1939 Vol. 71 to 1973 Vol. 100 (cont. from April 2001 Bulletin)

McC Campbell, J.C., 100 166
McC Crady, E. Pagan cosmonogies 72 44*
MacCrea, W.H. Continuous creation
 83 105*; 96 95d; 99 90
McDonald, H.D.
 Apologetic for miracles 93 159*;
 discussion 94 128;
 concept of authority 95 (2) 33*; 94 192 rw
McGavin, J.S.C., 75 83d
MacGregor, R., 78 134d; 81 80d; 88 130d
McHardy, W.D. 88 153d
McIntyre, J., 82 13d
Mackay, D.M.,
 Mechanism to mind 85 17*;
 Brain and will 90 103*;
 Divine activity 91 75*;
 Man as mechanism 91 145*;
 Recovery of harmony 94 204*;
 What makes a contradiction? 97 (1) 7;
 95 (1) 71 rw; 97 (1) 58r; 100 87rw 203
McKenzie, J.G.
 Atonement and psychology 75 30*
McLeod, N.M., 72 18d 174d; 73 204d
MacMurray, J., 85 128d; 93 108r
McPherson, T.
 Ayer on Religion 92 24*
Maccabean period, 99 96; 100 239f
Mace, D.R. Sex morality 79 203*
Mach, E., 100 5
magic, 99 235f
Magna Carta, 73 75
Mainx, F., 98 (2) 35
Mainz radicals, 94 (1) 14
Man. Ancient 99 74r 88 156r
 see Archaeology, Mitchell etc;
 biblical sense of 'man' 96 91) 9f;
 Genetics (Berry) 92 77*; 100 108;
 God's image (Davies) 71 171*;
 Human nature (Marston) 78 40;
 ... as Mechanism (Mackay) 91 145*;
 nature of (Berry) 92 77*;
 (Mikolaski) 97 (2) 3*;
 pre-Adamic 91 126*;
 psychology (Lodge-Patch) 92 86*;
 (Howard) 98 (1) 63*;
 Western 96 (1) 14f
Mandeville, D.C., 76 127d; 87 151d
Mansel, H.L., 100 51
Marais, E.N., 71 94

Marconi, M., 99 85
Maritain, J., 93 48r
Mark St., 100 12
Markille, R.,
 Explanation in psychology 97 (3) 17*
Marr, Prof., 73 79
Mars. Moons of 80 51
Marshall, I.H.
 Jewish dispersion 99 67r; 100 237*
Marshall, W.T., 73 115d 206d
Marston, Chas. (Sir).
 OT today ... Lachish 71 156*;
 Biblical archaeology 75 93*;
 Discovery from time ... Abraham 75 106*;
 conclusions, archaeology 76 174*;
 human nature 78 140*; 74 9d; 77 114d
Martin, B.C., 83 45d, 151d;
 84 76d 103d 150d; 85 116d;
 86 105d 116d; 90 130d
Martin, J.H., 90 132d
Martin, R.P., 99 75r
Martin, W.J. ... Language of OT 74 195*
Marx, Karl.
 Christianity and ... (Davies) 76 111*;
 Views on history (Pearce) 81 147*;
 Jesus or ... (Kenyon) 81 165*
Mascall, E.L., 95 (1) 9; 100 68 195r
Maslen, A.S., 80 30d
Masterton, P., 100 309r
masturbation, 100 93
materialism.
 New outlook (Aldis) 75 72*;
 New ... (White) 83 185*
mathematics. Use and misuse (Betts) 79 1*
matter, 99 82 91 170
Matthew, St.
 Composition ... gospel (Atkinson) 83 159*
Matthews, W.R. (Dean).
 Philosophy of religion 84 109*; 82 218d
Maunder, W.
 History of India ... 71 144*; 73 228d
Maurice, F.D., 100 37
Mawhinney, B.S.
 Man, origin ... nature 95 (2) 54*; 96 (1) 21
Maxwell, J. Clerk. ... Demon (Clark) 96 (2) 3*;
 94 192f; 99 83
Mbiti J.S., 99 251r
Meacham, S., 99 162r
meaning, 99 11r 250r
Means, R.L., 99 169r

- measurement*, 72 1
mechanism to mind (Mackay) 85 17*
Meadaw, P., 98 (2) 26
medicine. Ideals in
 Mercy and (Aitken) 99 141*
Meerwein, H., 100 219
meetings. Encounter
 Melita, 100 232
Mellanby, K., 100 4
memory, 100 203
mental disorders.
 Spiritual factors (White) 81 106*
mercy, 99 149
metaphor. Myth and 88 147
meteorites, 74 19
meteorology (Botley) 73 212*
Methodists, 72 80, 83
methyl iodide, 100 232
Michotte 96 (1) 75
Mickelsen, J.K., 87 121d, 141d;
 90 133d, 139d, 145d
Mikolaski, S.J. Of and about 93 55*;
 Nature of man 97 (2) 3*
Miles, F.J., 72 35d; 75 45d
Miles, I.R., 93 108r
Mill, J.S., 99 135
Millard, A.R., 93 194rw
millennium 73 51
mind. Body/brain and ... 80 58f; 91 68r;
 92 173r; 97 (2) 65; 99 17 166; 100 8;
 Uncultivated 85 52;
 unit of 96 (2) 10;
 unity 90 113; 98 (1) 63f
ministry, 95 (1) 45; 99 208f
Minnesota Studies, 99 82
miracles. Apologetic for (McDonald) 93 159*
 classification 73 56;
 Commission on ... 71 8;
 'explaining' 100 125;
 Physical Science (Farmer) 80 56*; 88 90;
 100 71;
 Place of in ... thought ... (Boulton) 83 29*;
 (Wright) 84 27*;
 outside science 100 263;
 parallels to /2 158;
 Recognition (Willingale) 97 (2) 52*;
 sight restored (Clark) 93 88*;
 discussion 94 128d;
 wonder caused 95 (1) 15; 98 (2) 49
mission to Islam (Sweetman) 92 138*
missing links 74 48
missions. Effects of 72 126
Mitchell, B.
 Modern empiricism 85 81* 135d
Mitchell, T.C.
 Archaeology and Genesis 91 28* 125d;
 90 144d; 96 (1) 9; 100 168
Mithras, 93 115r
Mixter, R.L., 92 112r
M1 jet, 100 232
Mobberley, E.A., 75 91d
Molesworth, W.H., 71 53d; 74 66d
Molony, F.A.
 Post-resurrection events 75 125*; 71 111d;
 72 96d 191d; 73 226; 74 10d; 75 29d
Monaghan, W.B., 71 185d; 76 23d
Monist League 100 97f
Monod, J., 100 222f
monotheism, 71 155; 72 45. Early 83 1f
Montague, A.E., 75 128ob
Moore, P., 100 188r
moral development (Crellin) 99 25*
moral education ... (Hilliard) 99 117*
Moral Instruction League, 99 118
moralising, 99 248
morals/morality. Attacked 100 87;
 Conduct and belief (Henry) 78 56*;
 dreams and, 99 155;
 ideas 100 90r;
 relative 100 91;
 Society and (Johnson) 95 (2) 6*
Morley, B.D.W. Ants ninth sense 71 80*;
 Mathematical biology 73 97*
Morris, H., 100 166
mortality, 73 98
Morton, J., 100 67r
Morris, L.
 St. John's Gospel 2 117*; 93 101d
Moser, L.I., 71 137d; 74 68d
Moses, 72 160 174; 91 184
Moses, L.I., 77 47d
mosses, 73 125
moths, 71 96
Moule, C.F.D., 99 76; 100 98
mountains, 72 208
Moynihhan, W.J., 85 116d
Muhammad, 99 106
Murk, J., 96 (1) 10
mutation. Neutral 100 107
mysticism. Spanish (Trenchard) 81 37*
myth. Bible and ... (Wright) 88 17* 145d;
 meaning 84 124;
 mythical time 96 (1) 36
national socialism, 100 96f
natural selection. See evolution.
 Of customs 100 90
natural theology. Evocative value 100 95;
 Gifford Lectures 99 253r; 100 194r;

history **96** (2) 15f; **100** 18f etc.;

Limitations (Lovelock) **84** 131*;

Mascall on **100** 194r;

Value to science **100** 85.

See teleology

nature. Attitudes to **99** 169;

Bible **73** 168, **98** (2) 48;

God and **98** (2) 49

See God, natural theology etc.

nature of man (Mikolaski) **97** (2) 3*;

of Universe (Filmer) **86** 17* 93d

Nazi atrocities, **100** 93

Nebuchadrezzar, **72** 145; **73** 1*

Needham, J., **71** 182

Neill, S., **100** 233

Neptunists, **100** 143

neurones. Loss of **99** 9

new wine or old bottles, **99** 61*

New Testament

... criticism today (Kenyon) **80** 105*;

Literary background (Bruce) **97** (1) 15*;

stories, framework **94** (1) 147r;

Transmission (Kilpatrick) **89** 92*;

discussion **90** 137d

Newton, I. (Sir). Creation and **99** 82;

Faith of (Hartill) **78** 75*;

historian **93** 112r;

on powers **99** 176

Nichols, J., **99** 232

Nicholson, J.B., **77** 28d

Niebuhr, R. H.D.Lewis on **82** 195*

Nilsson, H., **82** 185d*

nitrogen, **73** 107

Noah. See Flood, Ark

Nobel Symposium, 12th **99** 13

Nolet, Y., **90** 24d

'nothing - buttery', **91** 149; **99** 254

nova, **100** 73 f 79

Nowell-Smith, **90** 16d 26fd

numbers in OT (Clark) **87** 81* 145d; **100** 315

numinous The, **81** 20

Nunn, W.A., **78** 30d

Oakes, E.E. **85** 117d

O'Callaghan, J., **100** 12

O'Connell, P., **100** 178

oecumensim, **94** 142r

of and about, (Helm) **93** 55*

Ogden, S., **100** 45

O'Gorman, P.W., **71** 93d; **80** 49d 75d;

81 103d 160d

olam, **72** 210

Old Testament. Archaeology and Literary

criticism (P.J. Wiseman) **77** 101*;

Geographical background ... exegesis

(Houston) **86** 61* 121d;

Lachish discoveries (Marston) **71** 156*;

Language (Martin) **74** 195*;

MSS **71** 159;

Thoughts ... OT scholarship (Young) **93** 74*;

Use of in NT (Atkinson) **79** 39*

omphalos, **100** 30f

Oparin, **91** 116; **97** (2) 36f

Open University, **100** 216

Openness of being, **100** 97r

order, **88** 73

Orders, work by **72** 75f

origin of man (Dewar) **86** 2* 83d

See man

Orr, J.E., **95** (3) 47r

Orr-Ewing, H.J.

Medical miracles of Jesus **77** 19*

Orwell, G., **95** (2) 9f

Ossowska, M., **100** 90r

Otto, R., **85** 3f; **99** 226f

out-of-the-body, **99** 180

Ovid, **100** 131

Owen, H.

Darius the Mede **74** 72*; **87** 114d; 120d

Owen, H.P., **100** 64

Owen, R., **100** 19

ozone, **73** 190

pacifism, **93** 51r; **94** 18; **100** 88 90 299fr

Pagel, W.

Debt of science ... to belief in God **74** 99*

Pailin, D.A. Process theology **100** 45*

Packer, J.I. Fundamentalism **90** 35*

Palestine. Climate (Botley) **73** 212*;

maps **86** 125f

See Israel

Paley, W., **100** 18f

See natural theology

panentheism, **100** 63

Panin, I., **74** 12

panspermia, **81** 61

pantheism, **72** 60f; **99** 169

papacy, **73** 10

See Roman Catholicism

parables, **72** 112f; **73** 152f

parables. In Gospel of Thomas **92** 14;

OT and rabbinic (Stewart) **94** (1) 113*

paradigms of science **98** (2) 26f;

of evolution **98** (2) 32

paradox, **89** 73; **100** 53

paradoxical intention, **99** 72

parasitism, **100** 16

Parker, J.H., **73** 14d

Parlament, **99** 206

Parrot, A., **73** 88; **100** 160

- Patten, D.W.**, 100 160f
Patterson, J.H., 86 121d
Paul, St.
 Areopagus address (Blaiklock) 93 175*
 Psychology of epistles (White) 87 1* 107d;
 travels 71 24
Paul, L., 100 92r
Payne, A.W., 71 14d 36d 133d;
 72 114d 135d 172d; 73 202d; 74 179d;
 76 106d; 78 85d
Payne, D.F. Purpose ... Chronicler 93 64*
Peacocke, A.R., 100 82r 110
Pearce, G.J.M.
 ... Marxist views of history 81 147*
Pearce, V., 99 74r
Pember, G.H., 100 165
perception, 72 105; 96 (1) 76;
 defective 85 55
perfection 100 62
Perry, A.L., 87 114d 121d
personality.
 Conception (Wellisch) 82 113*; 94 207
Peter, St. At Rome? 71 31 33
Peter the wild boy 94 137
Petter, P.W., 79 217d
Petty, P.W.
 Nature ... Christian ethic 81 1*; 82 105d
Pharisees. Jesus and (Ellison) 85 35* 107d
Phenomenon of Man 96 (1) 55f
Phillips, J.B., 86 117d
philosophical principles
 teaching ... (Barnes) 88 80*
philosophers, 90 16f; 100 182
philosophy. Use of 93 48r
philosophy of religion (Hadwen) 76 94*;
 of religion, aim, scope (Matthews) 84 109*;
 idealistic 71 59f.
 See Cleobury
Philp, H.R.A., 74 127d; 81 119d
phlogiston, 72 5 12 21
physical science and miracle (Farmer) 80 56*
Piaget, J., 99 73r; 100 9
Pike, N., 99 73r
Pinnock, C.H., 94 134
Pinsker, L., 100 271f, 283
Pitt, F.W., 72, 194d; 73 18d
Planck, Max, 100 7
planets, 72 174f; 73 172f 204
plants ... hiatuses (Kelley) 73 118*; 100 230
Plato, 97 (3) 17
platonism and NT (Hughes) 82 19*
Pliny, 72 171
poetry, 89 85f; 94 (1) 3
poisons, 71 143
political science (Cameron) 95 (3) 2*
- Polkinghorne, J.C.**, 91 66rw
Pollard, W.G., 94 101
pollution, 99 85 169; 100 3
Popper, K., 98 (2) 27f; 99 166f; 100 221 236
population 73 101; 99 143f
pornography 100 94
Porter, Geo. (Sir), 100 223
Porter, L.E., 80 102d
Porter, R.A., 88 137d
positivism, 79 146f; 100 6
possession, 77 23f 28; 99 194
Powell, Baden, 100 22 32f
Powell, W.M., 78 30
Power, H., 99 4
powers, 99 160 176 179
prayer, 99 239 244; 100 76
preaching. Arguing and 97 (2) 49
precognition (Richardson) 78 1*
 See also W.E. Leslie
presentation ... gospel (Hannah) 89 26*; 90 116d
presuppositions of science
 (Hawthorne) 88 64* 74d;
 (Clark) 88 68* 74d
Price, G. McC., 100 165
Price, H.H., 79 199d; 96 (1) 76
probability, 99 62
process theology (Pailin) 100 45*; 95 155f
progress in evolution, 90 194
progressive revelation (Curr) 83 1*
prophecy.
 Apocalyptic and ... (Ellis) 96 (2) 28;
 Daniel 73 2f;
 foreboding 71 126;
 funtion of 71 5;
 ... literature 88 39;
 Psychological research and (Clark) 83 137*
 Science and portents (Clark) 74 17*;
 second advent 73 46
prophecs. Hebrew 95 (2) 72r;
 testing 80 48;
 waiting for another 100 197
Prosser, G., 88 136
Protestant thought and science, 92 169r
proteins, origin 71 50. See life
Protocols of Elders of Zion, 77 39 49 56
Prout, 99 247
providence, 99 83 85
psychiatry. Trends in (White) 91 135*
psychical research.
 Bible and (Wright) 80 33*;
 books 99 180;
 Dingwall on 99 192*r;
 prophecy and (Clark) 83 137;

Schmidt machine 99 180; 100 229
psychology.
 Analysis (psycho-) (Guntrip) 85 65* 123,
 91 130f, 93 106r, 99 244, see Freud;
 Approach to Christ's teaching (Lang) 72 104*;
 Bearings on religion (Conn) 74 116*;
 Biblical (White) 83 51*;
 Christ in Jungian (Evans) 88 2* 129d;
 Conception of personality (Wellisch) 82 113*;
 Explanation in (Markillie) 97 (3) 17*;
 Light thrown on man (Lodge-Patch) 92 86*;
 Paul's epistles (White) 87 1*;
 psychologists 100 182;
 psychosomatic disease 91 131, 100 117;
 psychotherapy 84 55, 91 139;
 of/and religion 84 82;
 (Guntrip) 85 65* 123d;
 (Jeeves) 89 104*;
 spiritual factors in mental disorders (White)
 81 106*
Ptolemy,
punishment, 71 167
 99 24f
Puritans ... origins of science
 (Turner) 81 85*;
 Royal Society (Turner) 92 95* 72 78
purpose, 97 (2) 28f
Q, 71 6; 93 123; 75 6
quasars, 99 177
Qumran MSS, 82 137;
 (Bruce) 84 163* 88 126; 90 210r;
 (Bruce) 90 92* (Bruce) 91 9*;
 (Ellison) 93 19* 100 12
rabbinic parables, 94 122
rabbincs, 100 199r
race, 100 96f 184f
radiation, 100 127
radioactivity, 99 159
Rae, B., 85 128d; 87 110d
Rahner, K., 99 19
rainbow, 73 223
rains; former and latter, 73 230
Ramm, B., 100 166
randomness ... in evolution (Barnes) 90 183*
Ras Shamra and Mari (Kenyon), 73 81*
Raven, C.E., 100 84
reason. Automata and
 faith and (Best) 85 30f;
 78 38*;
 revelation and (Curr) 74 1*
Reddie, James, 82 55
Red Sea, crossing of 73 220 226
red tide, 74 33
reductionism, 98 (2) 33; 99 2 54
Redwood, A. McD., 77 14d

Reformation, The
 72 75; 95 (1) 69r 73r; 99 203
reformers. Science and 100 205, 236;
 stepchildren 95 (3) 49r
refutation, 98 (2) 27f; 99 166
regresses, 99 160
Reid, D., 74 186d
reincarnation.
 Supposed evidence (Wright) 83 79*
relativism, 98 (2) 44
relativity, 71 54; 72 18 22; 94 194;
 99 91; 100 6
religion. Fancy or fact (Curnow) 92 58*;
 Gospel and (Jocz) 84 79*. See philosophy
 of religion, science and religion
religions. No agreement 99 132
religious experience, 99 10;
 instruction - see education report. See
 Christian Doctrine
representation theory, 96 (1) 76
resurrection of Christ, (Curr) 72 23* 36;
 Events following (Molony) 75 125*;
 Physicist's reflections (Scott Blair) 100 259*
Revelation, Book of.
 Apocalyptic 95 (1) 26, 96 (2) 40;
 authorship 77 123f;
 Portents (Clark) 74 17* 71 32
revelation. Progressive (Curr) 83 1*;
 ... science, mutual limitations (Clark) 79 138*
revivals, 72 80, 159; 75 27; 92 41; 95 (3)
 47r
revolt. Against heaven 97 (2) 78r
rheology 100 259
Richardson, C.A. Precognition 78 1*
Richardson, J.E., 82 100d
Rieu, E.V., 85 135d
Rig-Veda (Maunder), 71 144*
Rilke, R.M., 100 181
robbers' laboratory, 99 169
Roberts, B.J. Dead Sea scrolls 84 163*
Roberts, H., 87 134d
Robertson, E., 74 208d
Robinson, J.A.T. (Bp), 99 200 242; 100 75
Robson, G.W. Christian education 99 55*
 187d; 87 120d 126d; 88 148d; 90 140d
Roman Catholicism. Animals 93 40f;
 Bible and 100 197;
 objections to 92 168r; 94 151r;
 presuppositions (Simpson) 99 215*;
 science and 81 85f 103
Rookmaaker, H.R. 100 197r
Rose, E., 71 185d
Rose, H., 99 88
Rose, J.H. Seafaring ... 71 23*
Rothschild, Baron E. de., 100 279f

- Rowdon, H.H.**, 93 115rw
Rowley, H.H., 88 155d; 96 (2) 28f
Royal Society.
 Puritans ... (Turner) 92 95*; 89 80f
RPA, 100 35
Rudwick, M.J.S., 100 42
Rule, A.K. Wholesomeness of Christianity,
 USA etc. 75 20*
Ruoff, P.O., 72 120d 150d 159d; 73 159d;
 76 105d; 84 127d
Russell, Bertrand, 94 (2) 92; 99 161
Russell, C.A. Noah's Flood 100 145*, 216
Russell, D.S., 95 (1) 78r
Russell, E.S., 82 181d
Russell, E.W., 100 16
Russia. Pogroms 100 282 285
Ruth, 73 220
Ryle, G., 99 161 252; 100 71
- Sabbath*, 81 132f, 142. Rest, 72 205f
sacraments, 95 (1) 35f
Saggs, H.W.F. 84 23;
 Afterlife ... semitic 90 157*
salicylates, 99 85
salvation, 99 232
Samuel, (Vis.) 97 (1) 49
Samuel, L., 90 129d
Sangster, W.E. Sanctity, 85 1*
Sargent, W., 90 82r;
 and Wesley (Wood) 92 39*
Sauer, E., 97 (2) 79r
Sayers, D., 98 (2) 56
 sceptics. Anthropological analogy 95 (1) 72;
 Faith's debt to (Curnow) 91 103*
Schaeffer, C., 73 84
Schaeffer, F.A., 97 (1) 1r; 99 169r
Schelling, F.W.J. von 100 85
Schilling, H.K., 93 115r
Schlegel, R., 100 114
scholarship. Thoughts on OT ... 93 74*
Schmidt, H., 99 180
Schove, D.J., 73 227d
Schrödinger, E., 91 68r; 100 7
science.
 Bible and (van de Fliert) 98 (1) 11 (esp 39)
 (Clark) 98 (1) 43;
 biblical basis 98 (2) 52;
 belittles man 99 72;
 Christian apologetic (Spanner) 89 58;
 creed of 88 71;
 cruelty and 100 224;
 debt to belief in God (Pagel) 74 99*;
 end of 99 88;
 faith and (Boulton) 91 97 99 248;
 gaps 92 170;
 influence ... (ideas), universe (Curling) 89 78*;
 Janus-like 99 88;
 limits 85 167f, (Clark) 92 105, 100 70;
 man and 93 110r;
 method and tradition 100 70 154 220;
 mistakes of 99 197;
 peculiar 241*r
 in power 100 96f 119, 203r;
 presuppositions, see separate entry
 Puritans, see separate entry
 responsibility 100 230;
 revelation and (Clark) 79 138;
 snobbery 100 182;
 thinking of 99 160r;
 scientific outlook ... New ... (Aldis) 75 72*;
 scope 100 73 and see limits q.v.;
 stability 98 (1) 46;
 truth 98 (2) 27; 99 245
science and religion. Contribution ... sciences
 to religious thought (Betts) 76 132*;
 Teaching of (Barnes) 88 80*;
 Thoughts on (Curnow) 97 (1) 41*;
 93 198r 115r; 100 33 100r 228f etc.
Scorer, C.G., 90 147r
Scott, P.H. Wholesomeness of Christianity ...
 British history, 72 72*
Scott-Elliot, J., 100 124
Scroggie, W.G., 72 32d
sea. Does not fill 71 150;
 early 71 49;
 symbol of separation 71 32
seafaring in apostolic age (Rose) 71 23*
seagull's wing. Determinism and ... 100 217
second coming. Expectation of Jesus
 95 (1) 24f. see eschatology, prophecy
second law of thermodynamics, 72 4; 94 95;
 96 (2) 4f. See thermodynamics, entropy
secular records ... scriptures 87 25* 119d;
 (Wiseman) 87 26* 119d
Sedgwick, A., 100 19f 22 151
 "seeds" 74 105f
Segré, E., 100 120
self 97 (2) 11f; 99 225
Semitic concepts ... afterlife (Saggs) 90 157*
Senden, M. von 93 88f
Sennacherib.
 Assassination of (Chapelow) 75 116*
senses ... Ants (Morley) 71 80*;
 Perception and 96 (1) 75r
serpents. Fiery 98 (2) 66
seven, 99 109
seventy weeks (Fleming) 73 1*
sex. Culture and 92 135;
 Morality (Macc) 79 203*;
 puzzles of 100 92r

Shah, V.H., 100 119
Sharp, R.J.A., 90 28d
Shaw, H.K. Airy, 81 81d; 82 106d; 83 72d
Shelton, H.S., 71 184d
Shelly, B., 95 (2) 72r
Shepard, O., 100 181
shlps. Ancient, 71 29
Short, S.S., 94 (1) 143rw
Siddans, E.W., 79 26d
sight, 99 182;
 restored (Clark) 93 88*
Simon, U.E. Heaven in Hebrew tradition
 89 118*; 85 28d
Simons, T.K., 81 118d
Simpson, A.B., 88 49f
Simpson, G.C., 74 46
Simpson, M.,
 Presuppositions of Roman Catholicism 99 215*
sin. Evolution and original sin 98 (2) 8;
 of Flood generation 100 132;
 Joad's conversion 85 115;
 nature of 73 70;
 neurosis and 81 112;
 in OT 79 217;
 psychoanalysis 74 123;
 unpardonable 100 226;
 See atonement, guilt
six day war, 99 104
Skinner, T.C., 71 36d 73d 136d 155d;
 72 134d 151d;
 (biology in schools - letter) 73 237;
 74 180d; 76 168d; 77 xviii ob
Slater, C. et al, 99 87
slavery, 100 233
 (Jewish) 240
sleep, 99 153
smell, 71 182
Smith, J. Maynard, 100 108f 221
smoking, 95 (2) 14; 100 93
Smythies, J.R., 96 (1) 77r
snakes. In dreams 99 155
Snow, C.P., 99 241
Soal, S.G., 79 198d
sociology (Davies) 79 116*
Soddy, F., 99 168
solectrics, 72 174
Solomon, 71 150, 174f; 91 190;
 psalms of 97 (1) 24f
Solzhenitsyn, A., 100 119
Son of Man, 94 (1) 154r; 95 (1) 27
Sons of God, 100 134
soul. Biblical words 97 (2) 6f;
 biology 100 305r;
 concept in psychology (Howard) 98 (1) 63*;
 meanings 83 55f;

reflections (Adcock) 99 17*d
space-time(s). Two 98 (2) 56; 100 262
Spanish mysticism (Trenchard), 81 37*
Spanner, D.C.,
 Science and apologetic 89 58*;
 Thermodynamics and Christian view of life
 94 92*
 Creation, science and scripture 98 (2) 43*;
 90 148rw; 93 196rw; 98 13
Spanner, W.F., 74 14d; 76 50d; 78 51d;
 79 66d 94d 165d
Spears, E. (Sir), 77 51d
Spinoza. Shades of 100 16
spiritism. Popular belief 100 8
"spiritual" v literal 73 59 61
spontaneous combustion, 72 165
Stein, H., 99 82
Stafford-Clark, D., 90 82rw
Starkey, J.L., 71 158
stars, 71 147
Steele, F.R. God in history 84 1*
Stephens-Hodge, L., 76 48d
Stewart, B., 96 (2) 5
Stewart, R.A. Parable form in OT and
 rabbinic literature 94 (1) 113*
Stibbs, A.M., 83 177d
Stoics, 93 183f
Stokes, J.E., 84 49d
Stokes, G.G. (Sir), 99 253
stones cry out (Fawthrop) 72 137*
Stopp, F.J., 100 236
Storr, A., 100 312r
Straubenzee, A.H. van, 72 38d 115d 198d;
 73 23d 37d 55d, 75d; 74 12d 29d; 75 15d
stress, 100 118
Stuart, A., 100 235
Stunt, T.C.F. Capital punishment 93 95*d;
 History Victoria Institute 94 162*;
 93 49f; 95 (1) 69rw 73rw
suicide, 94 145r; 100 116 119
sulphur, 100 231 232
sun, 73 174f
supernatural, 74 29; 96 (2) 41r; 100 67*r 74f
Sutherland, B.P. Design in nature 73 166*
Suttie, I.D., 79 215; 85 124
Sweetman, J.W. Mission 92 138*
symmetry, 99 5; 100 114 235
synoptics. Dates (Davey) 73 147*
 See separate Gospels
Szent-Gyorgyi, A., 99 89
tao, 89 11
Tavener, L.E. Dilemma in Israel 94 105*
taxonomy, 73 120
teddy bear, 99 245

- Teilhard de Chardin.* See Chardin
teleology. Atmosphere (Farmer) **71 38***;
 ... and Causal nexus (Barnes) **95 (1) 4***;
 language of **97 (3) 12**;
 Present status (Dawes) **79 79***;
 Universe **82 90**.
 See natural theology, telepathy.
 Beliefs of public **100 7**;
 velocity **78 10**.
 See psychical research etc.
- Teller, E.,** **99 89**
temperature. Background **99 91**
Temple, W., **100 41**
Tennant, F.R., **84 33; 99 22; 100 41**
Teresa, St., **81 42f**
Testaments ... **97 (1) 20f**
testimony. Reliability (Clark) **72 156***; **99 8**
Thackray, A., **100 85**
theology. European ... today
 (Henry) **94 9***, (Bromiley) **87 65***;
 sociology (Davies) **79 116***;
 Why? (Barclay) **97 (2) 41***;
 theories of man's origin (Dewar) **86 2***;
 false **100 219**
therapy. Meaning **99 71r**
thermodynamics ...
 Christian view of life (Spanner) **94 92***;
 See entropy, second law
- Thexton, C.,** **85 11d; 87 113d 131d**
thinking, **100 311**
Thirtle, J.W., **72 195**
Thomas. Gospel of (Bruce) **92 3***
Thomas, H., **73 120**
Thomas, J., Spiritual nature and constitution
 of universe **71 58***
Thomas, K.V.
 Religion and decline of magic **99 235*r, 247**
Thompson, J.A., **93 194r**
Thomson, J.A. (Sir), **73 182**
Thornton, T.C.G., **90 27d**
Thorpe, A. St. J., **83 65d**
Thouless, R.H., **79 198d**
thunderbolts, **99 8**
Tillich, P., **97 (2) 47**
Timberlake, R.S., **83 19d; 85 15d**
time. African natives
 arrow **99 25Z**;
 biblical (Willingale) **100 114**;
 biology **96 (1) 25***;
99 6, 254;
 dimension **100 261**;
 God's **99 73r, 100 61**;
 mythical **96 (1) 36f**;
 reversal **96 (2) 9**;
 theology **99 73r**;
 waste **100 225**
- times.* Seven **99 101 104**
Tinder, D., **95 (3) 47rw**
Titanic, **100 225**
Titterington, E.J.G.
 Genesis and gospel **73 63***;
 Early history VI **82 53***;
 Glossolalia **90 62* 145d; 71 189d**;
72 64d; 73 22d; 74 127d 191d; 77 77d;
78 31d; 81 32d 161d; 82 50d; 83 13d
 69d 150d; **84 52d 151d; 85 14d 111d**
 130d; **86 83d 114d; 87 115d 126d 133d**
 148d; **88 132d 161d 180d 189d; 90 127d**
Tolman, R.C., **100 114**
Tomas, A., **99 156r**
Tongue, M.W., **86 104d**
tongues. See glossolalia
Torrance, T. Survival OT religious customs,
 China **71 100***
Toulmin, S., **99 167**
Townsend, H., **84 155d**
tradition, **99 77r**
transmission of NT (Kilpatrick)
89 92*; **90 137d**
"trees walking" (Clark) **93 88* 101d**
trees on comets, **100 193**
Trier, P.E., **77 68n**
Trenchard, E.H. Spanish mysticism, **81 37***
trends in OT study (Ellison) **88 32***
Tresise, C., **77 113d**
Tribe, D., **99 131**
Trinity, **71 176f 185; 78 78**
Troy, **71 167**
trust, **99 65**
Trusts. Craig **71 99**
truth. Objective **83 99**
tsetse flies, **100 4**
Turner, C.E.A. Early RS **92 95***;
 Puritan origins of science
81 85*; **81 144d 162d; 86 104d**
- tv,* **100 94**
two swords, **93 140**
Tyrrell, G.N.M., **79 197d**
- UFOs,* **99 157**
Ugarit, **73 85**
ultimates, **99 162**
unbelief. Causes (Curnow) **85 51* 115d**
underworld, **90 165f**
unicorn, **100 181 187 209**
uniformity, principle of **72 7**;
 in geology etc. (Booykaas) **88 101***
unity of Christians, **99 207**
universe.
 Conception ... conception of God **82 79***

- Nature and origin (Filmer) **86** 17* 93d;
spiritual nature (Thomas) **71** 58*;
uniqueness, in argument **99** 63
- Unwin, J.D.**, **79** 205f
- Uriah**, **71** 161
- Van de Fliert*.
Fundamentalism and geology **98** (1) 11*
Van Helmont (Page 1) **74** 99*
Varuna, **71** 155
varves, **99** 13; **100** 178
Velikowsky, I., **100** 188
Venusian, **100** 188*r
Verduin, L., **95** (3) 49r
Vere, D., **91** 144d 195d
Vermaseren, M.J., **93** 115r
verses, **100** 16,64
Victoria Institute. Essay funds, portrait of donors
76 frontispiece;
History, early years (Titterington) **82** 53*;
First hundred years (Stunt) **94** 162*;
objects of **98** (1) 5f;
VI and biblical criticism today (Kenyon)
82 223*;
and the Bible (Bruce) **86** 73*
Vietnam war, **100** 5
violence, **100** 95 133 299*r
virgin birth (Wright) **95** (3) 19*
viruses, **73** 122
vitalism, **97** (3) 8
vulcanism, **100** 147f
Vyuyan, J., **100** 120
- Waddington, C.H.**, **100** 112
Wagland, Dr., **81** 117d
Walker, G.S.M., **93** 49r
Walker, Kenneth, **79** 163d
Wallace, J.F., **83** 15d
Walls, A.F., **99** 76
war. Native reaction to, **100** 90. See violence
waste disposal, **99** 85
water, **73** 191f 207
Watson, P.S., Neoplatonism and Christianity
87 49*, 131d
- Weaver, A.K.**, **88** 76d
weaver bird, **72** 167f
weapons. Scientific **100** 121
Webb, C.C.J., **100** 41
Weber, M., **99** 64*r 175
Weizmann, C., **100** 277f
Welch, C.H., **79** 164d 216d; **80** 47d
Wellhausen. School of **72** 92 140
Wellisch, E., Conception of personality
82 113*; **81** 140d
- Wenham, J.W.** ... intellect in Christian faith
77 1*; **87** 150d; **100** 315
- Wentworth, Baroness**, **82** 178d
Werner, A.G., **100** 146
Wesley, J. Sargant and
discussion **94** (1) 146r; **95** (1) 75r
whales, **74** 36
Wheeler, L.R., **75** 84d; **76** 75d, 125d;
77 75d; **78** 101d; **79** 97d; **80** 29d 47d
Whewell, W., **100** 27f
Whiston, Wm., **100** 168
Whitcomb, J.C. Jr., **100** 166
White, Andrew D.,
98 (1) 47; **100** 34 78 144 206
White, Ernest. Relation of instinct and emotion
to religious experience **78** 109*;
Spiritual factors in mental disorders **81** 106*;
Preface to biblical psychology **83** 51*;
The new materialism **83** 187*;
Psychology of St. Paul's epistles **87** 1* 107d;
Sigmund Freud. life and work **90** 205*;
Modern trends in psychiatry **91** 135*;
76 166d; **80** 70d; **81** 103d 144d 176d;
82 73d 101d, 127d 231d; **83** 43d 97d 149d;
84 74d 149d; **85** 12d 125d 135d; **86** 103d;
87 125d, 132d, 139d 145d 153d;
88 129d 148d; **91** 130frw
- White, L.**, **99** 169
White, R.E.O., **95** (3) 47r
Whitehead, A.N., **100** 45 54
Whitelaw, R.L., **99** 14
Whitrow, G.J., **99** 94
wholesomeness of Christianity. illustrated by
British history (Scott) **72** 72*;
... recent events in India (Cranswick) **72** 124*;
(Ingram) **72** 129*;
... USA, New Zealand and certain Pacific
islands (Rule) **75** 20*
Whyte, L.L., **99** 5
Wilberforce, S., **90** 148; **97** (1) 42 (2) 76d;
99 162R; **100** 34
- Wilhelm II, Kaiser*, **100** 274f
Wilkinson, D.H., **99** 177
will, undisciplined **85** 60
Williams, E.L., **100** 233
Williams, L.P., **99** 168; **100** 209r
Willingale, A.E.
Development of doctrine in NT **95** (1) 17*;
Time in the Bible **96** (1) 25*;
Can we recognize a miracle? **97** (2) 52*;
94 131d 136d; **100** 194rw
will-o'-the-wisp, **72** 164
Wills, H.T., **72** 11d
Wilmer, H., **93** 101d
Wilson, C.L., **100** 219
Wilson, J., **93** 109r; **99** 125
wind, **71** 29; **73** 215

- wisdom lit.* (Ellison) 91 198*
- Wiseman, D.J.** Recent trends in biblical
archaeology 82 1*;
Genesis 10, archaeological considerations
87 13* 113d;
Secular records in confirmation, Scripture
87 25* 119d;
Place and progress of biblical archaeological
88 118*; 74 206d; 75 84d; 84 16d 183d;
86 113d 122d; 87 145d; 88 158d; 90 212r
- Wiseman, P.J.**
Archaeological and literary criticism of OT
77 101*; 73 94d 225d; 74 138d; 75 12d
104d; 76 104d; 77 142d; 78 25d 129d
146d; 79 178d 229d; 80 xvii ob
- Witchcraft*, 99 194 237; trials 100 74
- Withers, R.B.**, 73 59d; 74 10d; 75 13d;
78 50d; 88 169d; 90 138d
- Wolman, B.B.**, 99 83
- Wood, A. Skevington.** Dr. Sargant and
Mr. Wesley 92 39*; 92 172r; 93 112rw
- Wood, L.**, 72 178d
- Woodford, L.F.W.** Healing and atonement
88 48* 161d
- Wordsworth, W.A.**
Unity of Isaiah 72 180*; 72 98d
- worship.* Centralisation 72 92
- Wren-Lewis, J.**, 99 22 241*r; 100 7
- Wright, G.H. von.**, 93 192r
- Wright, J. Stafford.** Bearing of psychical
research on interpretation of Bible 80 33*;
- Decalogue and psychological well-being
81 122*;
Supposed evidence for reincarnation
83 79*;
Place of miracle in modern thought
84 27*;
Place of myth in interpretation of Bible
88 18* 145d;
Evidence for religious beliefs of palaeolithic
man 90 4* 144d;
Virgin birth as biological necessity
95 (3) 19*; 79 195d; 82 15d 125d;
83 14d 67d 152d; 84 18d; 88 133d;
96 (1) 9
- writing.* origin alphabet (Bruce) 80 1*;
early 71 157; 99 88
- Wurmbrand,** 97 (1) 2
- Wyburn, G.W., et al,** 96 (1) 75r
year-day theory 73 18, 21, 27; 99 104
- Young, E.J.** Thoughts on OT scholarship
93 74*; 97 (1) 3 ob
ylem, 99 91
- Zaehner, R.C.**, 99 132; 100 122
- Zealots,* 93 140
- Zeuner, F.E.**, 86 84d
- Zion.* Imitation of 100 193
- Zionism.* Christians in Zionist camp (Brodeur)
100 271*; 77 42; 99 84 93f
- Zodiac.* signs of 71 145f; 100 16

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	Volumes Concluded	
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