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paper was written for the 1997 UT Austin conference on
Naturalism, Theism, and the Scientific Enterprise.

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THE VOICE OF GOD June 1994

Frank Opie

Where does it come from ...
this strange awareness....
A conviction that I am not alone?

Is it from within myself? Undoubtedly!
...the Voice is my voice speaking in my mind.

Yet it is another's speaking....
I find my thoughts led willing captive, wandering along
paths that seem unfamiliar to the reported experiences
of others.
Always there is this sense of purpose....
progress towards an unknown, unchosen goal...
not my own.

Is the voice from beyond myself? Undoubtedly!
...my heart is a resonator for messages that reach into
me from every side, speaking of harmony and faith, of
love and care.

I seem to find myself thinking another's thoughts...
Yet not completely, for between us there is a
discontinuity - a tension caused by the uncertainty of
the path and the conflicting messages that press in on
my awareness. The nagging minutes of my daily routines
squeezing my day dreams into the conformity of the
hours.

Yet you keep calling with a quiet insistence that
overwhelms my distractions. You set me aside from a
task and I find my mind longing after you again. You
pour your creative awareness into me and I see and hear
- more than I saw and heard before - there is a sudden
quickenning and power flows through my heart.

Awareness, almost unbearably acute...
....a sweetness, the perfume of expectancy,
the essence of fulfilment.

I find you...
Sensitive, not demanding...
Consoling, but never satisfied to wait...
Patient and infinitely polite,yet urgent.

I hold my hands open in expectation and
never go empty away.

I hear your voice crying to me from the shore, the
waves, the skies, the mountains. You gaze on me from
stars, and birds eyes, from flowers and insects.
I sense your presence in the brush of people in the

crowd...the bright eyes of a student, the understanding heart of a friend....

the steady heartbeat of the ages -
eternally available on this frequency to those who
have been tuned to its wavelength.

What are you calling me for now, I wonder - where is
the next task. I am so conscious of my little time for doing
what you call for. My days run to a rapid close before my eyes
seem fully cleared of sleep. The glass of life runs to empty.

Somehow I must recreate the visions you have given to
me. I must hear the voice of eternity echoing in my heart
and capture the resonance of the ageless music for my world -
But is there a listener there?

My pen is ever ready ...but you must speak before I can
write. Save me the anxiety of wasted time and focus my will on
the music ringing unheard even now between the mountain peaks
and across the sunset horizons.

I know you have always been and that long after I have
gone home you will still be here...
My work is but a small part of your work - my feelings
and awareness a small part of yours.

I don't have to do more than answer your calls - but I
fear that I may have been a dull listener whose ears
were closed sometimes.

You keep calling us...
and we cannot rest without answering your calls.

Keep calling Lord of Life
for it is in the hearing of your voice that we know we
live.

Keep calling Lord of Light
for it is in the answering of your voice that we move
with faltering feet into your eternal illumination.

Keep calling Lord of Love
for it is in the reaching out and touching that we
are made one with your love that welcomes all your
creatures into the intimate place alongside your heart
where we belong together... and so we shall come home.

" In Him we live and move and have our being."

When we are lost in the woods the sight of a signal
post is a great matter. He who first finds it cries
"Look!". The whole party gathers round and stares. But
when we have found the road and are passing signposts
every few miles we shall not stop and stare. They will
encourage us and we will be grateful to the authority
that set them up. But we will shall not stop and stare,
though their pillars are of silver and their lettering
of gold. Not of course that I don't often catch myself
stopping to stare at roadside objects of even less

importance. It seems to today that all great literature, science and philosophy are signposts along the road.

C.S.Lewis - Surprised by Joy

Wisdom from the Past

THE GREATEST DRAMA EVER STAGED IS THE OFFICIAL CREED OF CHRISTENDOM

Dorothy L. Sayers

Official Christianity, of late years, has been having what is known as 'a bad press'. We are constantly assured that the churches are empty because preachers insist too much upon doctrine- 'dull dogma', as people call it. The fact is the precise opposite. It is the neglect of dogma that makes for dullness. The Christian faith is the most exciting drama that ever staggered the imagination of man - and the dogma is the drama.

That drama is summarized quite clearly in the creeds of the church, and if we think it is dull it is because we either have never really read those amazing documents, or have recited them so often and so mechanically as to have lost all sense of their meaning. The plot pivots upon a single character, and the whole action is the answer to a single central problem: What think ye of Christ? Before we adopt any of the unofficial solutions (some of which are indeed excessively dull)- before we dismiss Christ as a myth, an idealist, a demagogue, a liar, or a lunatic-it will do no harm to find out what the creeds really say about Him. What does the Church think of Christ?

The church's answer is categorical and uncompromising, and it is this: That Jesus Bar-Joseph, the carpenter of Nazareth, was in fact and in truth, and in the most exact and literal sense of the words, the God 'by whom all things were made'. His body and brain were those of a common man; His personality was the personality of God, so far as that personality could be expressed in human terms. He was not a kind of demon or fairy pretending to be human; He was in every respect a genuine living man. He was not merely a man so good as to be 'like God'-He was God.

Now, this is not just a pious commonplace; it is not commonplace at all. For what it means is this, among other things: that for whatever reason God chose to make man as he is-limited and suffering and subject to sorrows and death-He had the honesty and the courage to take His own medicine. Whatever game He is playing with His creation, He has kept His own rules and played fair. He can exact nothing from man that He has not exacted from Himself He has Himself gone through the whole of human experience, from the trivial irritations of family life and the cramping restrictions of hard

work and lack of money to the worst horrors of pain and humiliation, defeat, despair, and death. When He was a man, He played the man. He was born in poverty and died in disgrace and thought it well worth while.

Christianity is, of course, not the only religion that has found the best explanation of human life in the idea of an incarnate and suffering god. The Egyptian Osiris died and rose again; Aeschylus in his play, The Eumenides, reconciled man to God by the theory of a suffering Zeus. But in most theologies, the god is supposed to have suffered and died in some remote and mythical period of pre-history. The Christian story, on the other hand, starts off briskly in St. Matthew's account with a place and a date: 'When Jesus was born in Bethlehem of Judea in the days of Herod the King.' St. Luke, still more practically and prosaically, pins the thing down by a reference to a piece of government finance. God, he says, was made man in the year when Caesar Augustus was taking a census in Connexion with a scheme of taxation. Similarly, we might date an event by saying that it took place in the year that Great Britain went off the gold standard. About thirty-three years later (we are informed) God was executed, for being a political nuisance, 'under Pontius Pilate'-much as we might say, 'when Mr. Joynson-Hicks was Home Secretary'. It is as definite and concrete as all that.

Possibly we might prefer not to take this tale too seriously - there are disquieting points about it. Here we had a man of Divine character walking and talking among us-and what did we find to do with Him? 'The common people, indeed, 'heard Him gladly'; but our leading authorities in church and State considered that He talked too much and uttered too many disconcerting truths. So we bribed one of His friends to hand Him over quietly to the police, and we tried Him on a rather vague charge of creating a disturbance, and had Him publicly flogged and hanged on the common gallows, 'thanking God we were rid of a knave'. All this was not very creditable to us, even if He was (as many people thought and think) only a harmless crazy preacher. But if the Church is right about Him, it was more discreditable still; for the man we hanged was God Almighty.

So that is the outline of the official story-the tale of the time when God was the under-dog and got beaten, when He submitted to the conditions He had laid down and became a man like the men He had made, and the men He had made broke Him and killed Him. This is the dogma we find so dull- this terrifying drama of which God is the victim and hero.

If this is dull, then what, in Heaven's name, is worthy to be called exciting? The people who hanged Christ never, to do them justice, accused Him of being a bore-on the contrary; they thought Him too dynamic to be safe. It has been left for later generations to muffle up that shattering personality and surround Him with an atmosphere of tedium. We have very efficiently pared

the claws of the Lion of Judah, certified Him 'meek and mild', and recommended Him as a fitting household pet for pale curates and pious old ladies. To those who knew Him, however, He in no way suggested a milk-and-water person; they objected to Him as a dangerous firebrand. True, He was tender to the unfortunate, patient with honest inquirers, and humble before Heaven; but He insulted respectable clergymen by calling them hypocrites; He referred to King Herod as 'that fox'; He went to parties in disreputable company and was looked upon as a 'gluttonous man and a wine-bibber, a friend of publicans and sinners'; He assaulted indignant tradesmen and threw them and their belongings out of the Temple; He drove a coach-and-horses through a number of sacrosanct and hoary regulations; He cured diseases by any means that came handy, with a shocking casualness in the matter of other people's pigs and property; He showed no proper deference for wealth or social position; when confronted with neat dialectical traps, He displayed a paradoxical humour that affronted serious-minded people, and He retorted by asking disagreeably searching questions that could not be answered by rule of thumb. He was emphatically not a dull man in His human lifetime, and if He was God, there can be nothing dull about God either. But He had 'a daily beauty in His life that made us ugly', and officialdom felt that the established order of things would be more secure without Him. So they did away with God in the name of peace and quietness.

'_And the third day He rose again_'; what are we to make of that? One thing is certain: if He was God and nothing else, His immortality means nothing to us; if He was man and no more, His death is no more important than yours or mine. But if He really was both God and man, then when the 'man Jesus died, God died too, and when the God Jesus rose from the dead, man rose too, because they were one and the same person. The Church binds us to no theory about the exact composition of Christ's Resurrection Body. A body of some kind there had to be, since 'man cannot perceive the Infinite otherwise than in terms of space and time. It may have been made from the same elements as the body that disappeared so strangely from the guarded tomb, but it was not that old, limited, mortal body, though it was recognizably like it. In any case, those who saw the risen Christ remained persuaded that life was worth living and death a triviality-an attitude curiously unlike that of the modern defeatist, who is firmly persuaded that life is a disaster and death (rather inconsistently) a major catastrophe.

Now, nobody is compelled to believe a single word of this remarkable story. God (says the church) has created us perfectly free to disbelieve in Him as much as we choose. If we do disbelieve, then He and we must take the consequences in a world ruled by cause and effect. The church says further, that man did, in fact, disbelieve, and that God did, in fact, take the consequences. All the same, if we are going to

disbelieve a thing, it seems on the whole to be desirable that we should first find out what, exactly, we are disbelieving. Very well, then: 'The right Faith is, that we believe that Jesus Christ is God and Man. Perfect God and perfect Man, of a reasonable soul and human flesh subsisting. Who although He be God and Man, yet is He not two, but one Christ.' There is the essential doctrine, of which the whole elaborate structure of Christian faith and morals is only the logical consequence.

Now, we may call that doctrine exhilarating or we may call it devastating; we may call it revelation or we may call it rubbish; but if we call it dull, then words have no meaning at all. That God should play the tyrant over man is a dismal story of unrelieved oppression; that man should play the tyrant over man is the usual dreary record of human futility; but that man should play the tyrant over God and find Him a better man than himself is an astonishing drama indeed. Any journalist, hearing of it for the first time, would recognize it as News; those who did hear it for the first time actually called it News, and good news at that; though we are apt to forget that the word Gospel ever meant anything so sensational.

Perhaps the drama is played out now, and Jesus is safely dead and buried. Perhaps. It is ironical and entertaining to consider that once at least in the world's history those words might have been spoken with complete conviction, and that was upon the eve of the Resurrection.

Dr. Dorothy L. Sayers, M.A. Oxon. Hon. D. Litt., was a Literary Scholar and novelist. This is taken from "Creed or Chaos? And Other Essays in Popular Theology." (1947) Methuen & Co. Ltd., London. pp. 1-6

ANECDOTES FROM THE NATURALISTS... (From the Internet)

The great naturalist, Charles Darwin, was once approached by two small boys of the family whose guest he was. They had caught a butterfly, a centipede, a beetle, and a grasshopper. Taking the centipede's body, the butterfly's wings, the beetle's head and the grasshopper's legs. they had glued them together to make an alarming and original insect.

"We caught this bug in the field," they said innocently.

"What kind of a bug is it, Mr. Darwin?"

Darwin examined it with great solemnity. "Did you notice whether it hummed when you caught it, boys?" he asked gravely.

"Ye, sir" they answered trying to conceal their mirth."

"Just as I thought," said Darwin. "It is a humbug."

Professor Agassiz, the naturalist, had declined to

deliver a lecture before on lyceum or public society, on account of the inroads which previous lectures given by him had made upon his studies and thought. The gentleman who had been deputed to invite him continued to press the invitation, assuring him that the society was ready to pay him liberally for his services. "That is no inducement to me," replied Agassiz, "I cannot afford to waste my time in making money."

A committee of the French Academy employed in the preparation of the Academy Dictionary, defined the word "crab" as follows: "Crab: a small red fish which walks backwards." Commenting on this definition the celebrated naturalist Cuvier said: "Your definition, generally, would be perfect, only for three exceptions. The crab is not a fish, it is not red and it does not walk backward."

Source: Fuller, E. (Ed.) (1942) Thesaurus of Anecdotes. Crown Publishers, New York.

THE STRANGE WORLD OF THE PSYCHICS

Notice concerning Clairvoyance meeting in a local newspaper: "Cancelled due to unforeseen circumstances."

Why do psychics have to ask you for your name?

How many of you believe in telekinesis? Raise my hand...

NEWS BRIEFS (From the Internet)

* Astrophysicists detect dark Matter

Dark matter cannot be seen because it emits little or no radiation. Scientists have been able to detect its presence indirectly using a by measuring the extent of bending of radiation by gravitational sources such as black holes. The aim is to determine the large-scale structure of the universe and thereby test cosmological theories (Nature 11 May 00 405:143).

* Scientists fake discovery of coelocanth

Three French scientists have tried to fake the discovery of the living fossil fish. The fraud was perpetrated by altering photographs using computer software and is apparently quite easy to do. (Nature 13 Jul 00 406:114)

* Uprooting the tree of life

This is the title of an article by W. Ford Doolittle. The consensus view until very recently is that a main trunk of primitive "bacteria" called the archaea gave rise to prokaryotes (the true bacteria) which then gave rise to discrete branches of eukaryotes (plants, fungi and animals). New evidence suggests that while the upper reaches of the tree is essentially correct, the lower reaches are extensively reticulated with branches joining and dividing in a complex network (Scientific American Feb 00).

* First discovery of water in an asteroid

Within 48 hours of its fall to earth, a meteorite was opened in laboratory conditions and found to contain water in the form of sodium chloride-potassium chloride brines. The meteorite fell in March 1998 in Texas, USA. It provides evidence of the existence of water during the early stages of the development of the Solar System (Science 27 Aug 99 285:1377).

* Early hominids evolved from knuckle-walkers

Until now paleoanthropologists were at loss as to what form of locomotion preceded bipedalism in hominids. Now researchers have discovered specialised wrist morphology associated with knuckle-walking in *Australopithecus anamensis* and *Australopithecus afarensis*. The study has added significance because it confirms molecular evidence that chimpanzees and humans are more closely related to one another than either is to gorillas (Nature 23 Mar 00 404:382).

* Tobacco implicated in leading cause of death in the USA

Chronic obstructive pulmonary disease is now the 4th leading cause of death inflicting about 14 million people in this country. The culprit is largely tobacco. Only 3 percent of white male nonsmokers have the disease compared to 14 percent of white male smokers (New England J. Med. 27 Jul 00 343:269).

* Bioterrorism a more serious threat than nuclear winter

This is according to Donald Henderson of Johns Hopkins University. Biological agents are easily transported, difficult to intercept, silent and extremely difficult to detect. Only a few pathogens would be effective as biological weapons, but the few are deadly. Anthrax, for instance, has a fatality rate of 80% (Science 26 Feb 99 283:1279).

* Water found on moon of Jupiter

A magnetic field detector on the Galileo probe has

provided strong evidence of water on Europa. The best explanation of the data is a salty ocean below a crust of ice. Scientists plan to launch a Europa orbiter in 2003 to settle the matter. (Science 25 Aug 00 289:1305)

* HIV is the cause of Aids

This is the verdict of more than 5000 scientists and medical professionals at a much publicised conference recently in Durban. The evidence, they say, is clear-cut, exhaustive, unambiguous and meets the highest standards of science and the denial by some politicians will cost countless lives.

* Organised religion "a sham and crutch for weak-minded people."

So said former pro-wrestler and professing Christian Governor Jesse Ventura in an interview with Playboy magazine. The statement has created a furore in Minnesota, USA. Ventura regrets the comment, "Personally, I'll survive it, and I knew I would. But it was very difficult for my family in light of what happened." Now the Pastor of the Lutheran church that Ventura attends says he is trying to minister to Ventura and his family.

* Drug extends life - in worms

Researchers have developed a drug that extends the lifespan of nematode worms from 21 days to 35 days. The drug is a powerful enzyme used to control oxygen stress. It is hoped that such research will eventually be used to combat diseases such as Alzheimer's and Parkinson's. Researcher Simon Melov says, This is the first high-profile example of a lifespan being extended using a drug." Em.. high-profile? Michael Jackson taking the drug ... that would be high-profile.

Spot the Fallacy

WOULD THE REAL CAUSE PLEASE STAND UP:
EXTREME SINGLE-FACTOR THINKING

Mike L Anderson

The other day I overheard an exchange between two Christian workers that led to some tension between them. Let us call the two Arthur and Jane. It went something like this.

Arthur: "Did you know that John has turned 80! He looks closer to sixty!"

Jane: (with authority): "Well, that's what a healthy life-style does for you!"

Arthur (with an equally authoritative counter): "God

decides how long you will live and that's that."

Jane said nothing, but looked away shaking her head slowly and deliberately.

It was noble of Jane to champion healthy living and Arthur to champion the doctrine of God sovereignty. With all their good intentions something went awry. Let us see if we can help Jane and Arthur resolve their differences by uncovering any fallacies they may have made.

Arthur understands Jane to mean that healthy living is the sole cause of a long life. If Jane really means this, then she has fallen into single-factor-thinking by treating the complex phenomenon of health as if it had a single cause. There are, of course, many factors that influence health including circumstances and one's genes. I suspect that, if pressed, Jane would have admitted this. Perhaps she means that a healthy lifestyle is the most significant factor in longevity.

Arthur would have none of this. In this Christian setting, his counter is, rhetorically, very effective. Which Christian is going to argue against God! For Arthur God is the real cause of a long life. Jane seemed to be aware that something was wrong with Arthur's position, hence the shaking of her head, but apparently struggled to put her finger on it.

Where is the fallacy? True, God does decide how long one will live. But, Arthur added "and that's that." To the extent that Arthur brought in God as a counter to Jane's lifestyle factor, he reduced Him to a factor in competition with other factors. This is extreme single-factor-thinking! The god-is-a-factor fallacy treats God as if He were an alternative to the lifestyle explanation.

By contrast, Jesus taught God's sovereignty and human responsibility in the same breath. "The Son of Man will go [to his death] as it has been decreed [God's sovereignty], but woe to that man who betrays him [human responsibility]" (Luke 22:22). We have here what theologians call an "antinomy." Try as we might, it seems impossible for us as humans to reconcile these two truths. Theologian, J.I. Packer, describes the appropriate attitude when confronted by an antinomy.

"God's sovereignty and man's responsibility are taught us side by side in the same Bible; sometimes, indeed, in the same text. Both are thus guaranteed to us by the same divine authority; both therefore, are true. It follows that they must be held together, and not played off against each other (1)."

"Accept it for what it is, and learn to live with it. Refuse to regard the apparent inconsistency as real; put down the semblance of contradiction to the deficiency of your own understanding; think of the two principles as, not rival alternatives, but in some way that at present you do not grasp, complementary to each

other" (2).

Inappropriate responses to antinomies can have far-reaching implications. Jane and Arthur are evangelists. They go into the world not only with their evangelistic tracts, but also with a particular view of God. If they go with a god-is-a-factor view the results may be less than happy. Those in their audience who have a much better grasp of the natural world could very easily decide they have no need for the god-hypothesis (3). However, they may not be theologically aware enough to believe in the Sovereign One. Instead, they may decide to not believe in God at all.

1. Packer, J.I. (1976) Evangelism and the Sovereignty of God. Inter-Varsity Press, Leceister, England, pp. 22-23.

2. Ibid., p. 21

3. This echoes the celebrated retort of Laplace when confronted by Napoleon for failing to mention God in his treatise on celestial mechanics, "I have no need of that hypothesis." Laplace had too great view of God to be seduced by the god-is-a-factor fallacy. See Jaki, S. (1974) Science and Creation: from Eternal Cycles to an Oscillating Universe. Scottish Academic Press, Edinburgh, p. 292.

ENTERPRISING SCIENCE NEEDS NATURALISM

by Wesley R. Elsberry

ABSTRACT

There is a distinction to be made between descriptive and prescriptive philosophical treatments of science. For example, while some take Popperian falsificationism as a recipe for the practice of science, Popper's discussion of various sciences so-called makes it clear that he intended science to be recognized because it included falsifiability, not because falsifiability might be added, like some rare spice, to an existing field of study. Kuhn also wrote no cookbooks, rather, he reappraised what actual scientific practice looked like. It is no accident that both of these philosophers came to use natural selection as a metaphor for the operation of science. The modern practice of science is premised upon the radical assumption that the physical universe is comprehensible to humans. That this assumption is radical is supported by the fact that it has not always historically been accepted, that it remains largely unassimilated even today, and that many explicitly reject it since they believe that it denies any reality to theism, mysticism, or even mystery. The modern practice of science also requires that objectivity be approximated, even if it cannot in principle be completely achieved. The practice of

science is a pragmatic endeavor whose principle product is the conversion of subjective personal experience into an approximation of objective knowledge concerning physical phenomena. While the subjective appreciation of a role for supernatural causation may be important to personal fulfillment, it does not afford a basis for objective knowledge, nor can it be counted as a means of comprehending the universe in a scientific manner. I will connote "naturalism" as "proposing only natural mechanisms for physical phenomena" rather than "asserting that only natural mechanisms have existence". The debate over naturalism and its relationship to scientific practice most often arises today in discussion of education in biology. There is concern in education that discussion of the scientific method should include information not only about how science ought to be conducted, but also about how science actually is conducted. My answer to the question, "Does the scientific method exclude appeals to supernatural causation?" has to be yes, since I consider naturalism to be a corollary to the assumption that the universe is comprehensible by humans. Rejection of naturalism amounts to an assertion that some parts of the universe are not comprehensible by humans, which even if true is a sterile stance. I entertain the possibility that the founding assumption of science may be literally false, but even if it is sometimes false, it is often true and retains much value thereby. Science has as its domain physical phenomena and its range is the set of scientific explanations of those phenomena. Natural explanations are the only known variety that produce an increase in scientific comprehension. In a particular case study, the claim made by A.E. Wilder-Smith that simulations of evolutionary processes demonstrated the failure of natural explanations is demonstrated to have been false, as evidenced by the success of the fields of artificial life, genetic algorithms, and evolutionary programming.

INTRODUCTION

Science is "what scientists do," or so opined Judge Overton in his 1982 ruling in 'McLean vs. Arkansas' (Overton 1984, p.380). As a definition, it has the apparent drawback of recursiveness. However, this formulation is not necessarily recursive, if one avoids defining "scientist" as "someone who does science". It still retains some of the inscrutable character of fully recursive definitions, but provides at least one important insight. That insight is that science, as a method of study, is defined by its practice, and not by edicts from on high.

Edicts from on high concerning science include those prescriptive statements forwarded by Bacon and Descartes. Bacon believed science could only come from an inductive review of copious evidence collected from empirical study, while Descartes advocated the viewpoint that a rigorous application of logic should yield correct theories of science.

Newton, in producing his 'Principia Mathematica', did not strictly adhere to the recommendations of either Bacon or Descartes, but utilized elements from each.

The emphasis in philosophical treatment of science shifted thereafter from the prescriptive to the descriptive. The question was not, "How should Newton have done it?", but rather, "How did Newton do it?" After all, Newton's immense success and regard would impose a heavy burden upon the prospective prescriptive philosopher of science, simply to avoid appearing embarrassingly arrogant.

Some have mistaken modern descriptive treatments for prescriptive treatments. This is especially true of Sir Karl Popper's famous demarcation criterion of falsification. Within Popper's framework, a field of study can be recognized as being scientific if it produces theories that can be falsified, not if it can add falsifiable statements to an existing body of conjecture. In particular, Popper establishes why he believes Freudian psychology and Marxian historicism to be beyond the pale of science.

Kuhn also made an attempt to describe rather than prescribe the course of scientific study in his 'Structure of Scientific Revolutions'. Unsatisfied with other popular descriptions of science as steadily progressing toward greater knowledge, Kuhn produced a different view of the scientific process. This view introduced the notion of the 'paradigm shift', where the basic postulates of an older paradigm are overthrown in favor of a more capable set of postulates that comprises a new paradigm.

But what about the possibility of supernatural causation for natural phenomena? Is science competent to examine the case where a supernatural agency acts in the physical world? In modern times, many have argued that for various reasons, diagnosed insufficiencies in current theories establish the necessity of invoking supernatural causation. I find various problems in this kind of endeavor, both on procedural and historical grounds. The best way of examining how argument for the serious treatment of supernatural causation in science works is to look at an example, so I will consider one below.

A CASE STUDY IN ARGUMENT FOR SUPERNATURAL CAUSES

A. E. Wilder-Smith was an author of several books which expressed a critical view of what he termed "scientific materialism". He advanced various arguments to this end. The one that I will focus on here comes from his 1970 book, "The Creation of Life: A Cybernetic Approach to Evolution". In this argument, Wilder-Smith says that Paley's "argument from design" must be regarded as valid because the Darwinian theory of evolution which displaced it has been found to be actually false. There are several reasons to suspect that Wilder-Smith's rehabilitation of Paley's argument was premature, including the fact that he ignored other critiques, but the one reason of primary concern to me here is his claim that Darwinian theory has been falsified by the only legitimate experimental evidence available. The nature of this claim and the subsequent developments in the field of computer science which are relevant say, quite eloquently, that the appeal to supernatural causation in the scientific method is always premature.

A prerequisite for establishing supernatural causation would be to find an area of natural phenomena without known natural mechanisms. Wilder-Smith attempts this early on in 'The Creation of Life'. He declares that the 1965 Wistar conference, 'Mathematical Challenges to the Neo-Darwinian Interpretation of Evolution', exposed "missing factors" in Neo-Darwinian theory, including ones arising from the study of cybernetics. By clearing away Darwinian theories, a playing field is opened for supernatural action.

"In addition Schutzenberger pointed out that recent developments in computer science have shown that the spontaneous evolution of a self-replicating organism is a phenomenon which has never been duplicated or simulated successfully even on the largest and most rapid computers available to date." (Wilder-Smith 1970, p.39.)

Above, Wilder-Smith identifies computer science as the field in which experiments relevant to abiogenesis and evolution can be tested.

"[...] Order is of two kinds in our present discussion. There is the kind of order which is truly a pattern -- like ripples on the seashore -- but which bears no code meaning. This order can be compared to letters in an ordered sequence which conveys no particular meaning. Then there is the other kind of sequenced order which hides a meaningful code -- like a section of Goethe's poetry. We know of only one way in which the latter can arise and that is by the exercise of intelligence. The first kind can arise either with or without the direct intervention of intelligence." (Wilder-Smith 1970, p.73.)

Wilder-Smith makes an assertion concerning how new information can arise, one which excludes any agency except that of the "direct intervention of intelligence." Wilder-Smith again relies upon the reports from the Wistar conference.

Wilder-Smith infers that the lack of algorithms in computer science to produce information from evolutionary principles indicates that Neo-Darwinian theories are deficient in content.

"The point is, of course, that, as things stand today, random and adaptive evolutionary theories have not yet supplied the programming ground rules for extracting order spontaneously from random processes or for constraining such processes. Surely this fact can only mean that some fundamental gaps still exist in current Neo-Darwinian theories which allegedly account for evolution as a result of random processes followed by competitive selection." (Wilder-Smith 1970, pp.110-111.)

Wilder-Smith asserts that simulations reveal an inability to produce new sequences via Darwinian mechanisms.

"Darwinians and Neo-Darwinians have long maintained that randomness, plus long time spans, plus natural selection would, in combination, do the synthetic trick and deliver specific codes and molecules. However, recent progress in cybernetics has shown by simulation experiments that order sequences, specificity and coding cannot be extracted from randomness on the basis

of the Darwinian postulates." (Wilder-Smith 1970, p.116.)

The criterion of testing by experience is one which Wilder-Smith claims to have gone by the boards in the case of Darwinian mechanisms.

"The unwillingness to abandon the foundering ship of Darwinian chance hypothesis came out quite surprisingly in the symposium mentioned in chapter 1. The following citation shows the fundamental unwillingness to submit to the only sound experimental evidence available on the subject:

'Dr. Schutzenberger: I want to know how I can build on computers, programs which....'

The chairman, Dr. Waddington: 'We are not interested in your computers!'" (Wilder-Smith 1970, p.130.)

Wilder-Smith goes on to explicate how Darwinian theories displaced the argument from design.

"The great advantage of the randomness theory of Darwin with its accompanying natural selection and long time spans was that it destroyed the abhorred necessity of divine intelligent activity behind nature. Today, those in progressive circles in mathematics and physics conclude that cybernetic simulation experiments establish the fact that the principles of randomness plus selection plus long time spans cannot and do not replace the earlier concept of extramaterial constraint acting on matter to produce order, including the order of life. One hundred years ago Darwin's hypotheses were not susceptible of experimental and theoretical disproof. Now they are." (Wilder-Smith 1970, p.219.)

This gets to the nub of the argument. Wilder-Smith asserts again that computer simulations are the place where experimental test of Darwinian hypotheses can be made. It should be noted here that Darwin did not hypothesize concerning abiogenesis, which was a major topic in Wilder-Smith's book. Therefore, this passage above can be seen to apply directly to natural selection rather than abiogenesis.

Eventually, Wilder-Smith writes a rousing, emotive section to reiterate his claim:

"It is only in recent years, with the advent of the "super-computer" which could automatically, swiftly and surely deal with the astronomical numbers in which Darwin enshrouded his theory, that the denouement of the grand scheme becomes possible. The astronomical numbers of random changes, the long time spans and the alleged evolutionary "trends" in the midst of randomness have been programmed and fed into super-computers. The result has been dramatic, for the machines jam in their efforts to unravel such tangled masses of informational "noise." No wonder that the mathematical experts have crowded around the site of these experiments just as physicians crowd around the bed of a patient sick of a rare disease, to ascertain the cause of the excitement. The biologists have mocked from a distance and denied the result proclaimed by the mathematicians -- that the theory will not work but merely jams the best machines." (Wilder-Smith 1970, pp.232- 233.)

And here Wilder-Smith summarizes, but does not cite, the evidence of experimental test. Attempted simulation

of biological evolution justs "jams" computers, thus Darwinian hypotheses are debarred, and thus Paley's argument from design is rehabilitated.

"It has been well pointed out by Robert Bernhard that a basic assumption of evolutionary theory is that "increasing complexity is an essential feature of evolution, but there is no explanation for that phenomenon in the theory." This very factor is the crux of the whole question of the missing factor in Neo-Darwinian theory. Information theory requires a programmer to account for the increasing complexity of the whole program of evolution. The theory as it stands provides for no information source to account for the increasing complexity. Yet it is perfectly clear today that life shows the most complex programs conceivable. Darwinians dare no longer close their eyes to this basic fact which will require explanation in terms of information theory -- the more so as knowledge in this area becomes more generally available." (Wilder-Smith 1970, p.244, emphasis in original.)

Wilder-Smith gets specific about what he sees as missing: a mechanism for the production of new information and complexity, indicated by the principles of information theory.

One consequence of a designer for the universe is explicated by Wilder-Smith in the following.

"Exactly the same problem would be expected to beset the relationship between the designer behind nature and the intelligently designed part of nature known as man. Obviously the great designer behind the universe speaks a huge number of languages in the expression of his huge intellectual capacity. He speaks, as Jeans said, among others, a mathematical language. But, on top of this, he speaks the chemical language of the elements as well as the languages of physics, geometry, algebra, philosophy and so on. The language of chemistry which he speaks in designing his thought according to DNA coding sequences is a subject in itself. The average human has all he can cope with in maintaining one language with which to communicate. Thus he is likely to be able to absorb only very small amounts of the designer's multilanguage. No one today can be familiar with all the languages of all the sciences. Once more we have the old difficulty of establishing communications between the designer and the designed on account of language barriers." (Wilder-Smith 1970, p.248.)

Wilder-Smith explicitly denies the axiom that the universe is comprehensible by humans in the above.

"[...] My point is that modern biology has made the use of aeons a necessity and a cardinal point of its dogma to overcome the inherent clumsiness of the trial-and-error mechanism it postulates. The supreme coding and programming of all nature should open our minds to the consequences of the factor of intelligence. For intelligence does things differently -- and more quickly!" (Wilder-Smith 1970, p.254)

Intelligence does do things differently, as I will explain in more detail later on. This does not turn out to be a point in favor of Wilder-Smith's argument.
Summary of Wilder-Smith's argument

Wilder-Smith asserts the invalidity of Neo-Darwinian and Darwinian hypotheses to satisfactorily explain abiogenesis, ontogenesis, or phylogenesis. Since the first two are not the subject of Neo-Darwinian or Darwinian hypotheses, we will exclude discussion of those claims. He relates the experience of Marcel-Paul Schutzenberger, who apparently failed in attempts to program simulations of biological evolution on super-computers. The approach of Schutzenberger is one which Wilder-Smith characterizes as the only sound means of gathering experimental evidence concerning these topics. This is an important point, since Wilder-Smith stakes his entire argument upon the conclusiveness of Schutzenberger's experiments.

In short, Wilder-Smith's logical argument may be stated as follows. Paley's "argument from design" was rebutted by Darwinian hypotheses. Computer simulations are the only sound means of accumulating experimental evidence to test Darwinian hypotheses. Computer simulations of biological evolution fail to accord with the stated results of Darwinian hypotheses, that sequence, specificity, or coding information can arise from random processes coupled with competitive selection. The failure of experimental tests of Darwinian hypotheses invalidate those hypotheses. Other hypotheses formerly abandoned due to the existence of the previously untested, and now falsified, Darwinian hypotheses must now be re-evaluated. Specifically, Paley's "argument from design" is rehabilitated and must be viewed as being valid. Information theory and the argument from design imply that humans can accrue only a limited and partial knowledge of the universe. The response to Wilder-Smith's argument 'Paley's "argument from design" was rebutted by Darwinian hypotheses.':

This is a true statement so far as it goes, but it fails to note that other rebuttals of Paley's argument exist. Paley's "argument from design" has been critiqued by a variety of people using a wide range of arguments. Even if Darwinian hypotheses were found to be falsified, Paley's argument would be far from rehabilitated. However, Darwinian hypotheses are far from being falsified.

'Computer simulations are the only sound means of accumulating experimental evidence to test Darwinian hypotheses.':

While I personally am skeptical of the exclusive nature of this claim, I will agree that computer simulations do represent a sound means of performing experimental research on Darwinian hypotheses.

'Computer simulations of biological evolution fail to accord with the stated results of Darwinian hypotheses, that sequence, specificity, or coding information can arise from random processes coupled with competitive selection.':

This assertion was key to Wilder-Smith's argument, and

it has since been shown to be unequivocally false. It may, in fact, have been untrue at the time of publication of Wilder-Smith's work, or even perhaps before the Wistar conference to which Wilder-Smith makes heavy reference. John Holland's mid-1970's work on genetic algorithms marks a watershed in the application of Darwinian principles to computer science. Since then, the inter-related fields of genetic algorithms, artificial life, and evolutionary programming have demonstrated that informational sequences can, indeed, arise from computer simulations based upon principles taken from biological evolution. Because this point was crucial to Wilder-Smith's argument, it is useful to spend some effort in documenting how it is known to have failed. John Holland coined the term "genetic algorithm" for one component of his larger work on "classifier systems". The "genetic algorithm", or "GA", in Holland's formulation, was a process which operated upon a population of initially randomized fixed-length bit strings, each of which was evaluated at each iteration for fitness, and which were copied with variation to form a new population of bit strings. The whole process was premised on a fairly simple reading of Darwinian natural selection and basic genetics. Holland saw the bit string as analogous to the chromosomal content of an organism. The evaluation function performed the service of environmental constraint. Holland stressed the role of "crossover" in production of useful variation over mutation, though mutation still was part of the copying process. Because the original bit-strings forming the candidate population were randomly set, it can readily be seen that the operation of Darwinian processes was able to produce new and useful information.

The absolutely critical fact to be apprehended is that Holland's GAs were successful. These GAs not only did not "jam" computers, they were found to be capable of resolving very difficult optimization problems. Some of the applications for which GAs have been found useful include oilfield pipeline layout, Hubble telescope job scheduling, and contaminated ground-water remediation well placement.

Another insight revealed by GAs is that the utility of Darwinian processes is not dependent on logical necessity. That is, a GA does not necessarily produce an optimal or near-optimal result. Phillip Johnson critiqued one non-tautologous formulation of natural selection for not entailing a necessary outcome of success (1993, p.23). However, the common success of GAs points to general utility rather than the possible complete lack of utility which Johnson intimates in his critique.

One might well ask what the solutions that GAs produce look like upon human examination. The answer is that GAs produce near-optimal solutions that look very different from solutions that human engineers produce for the same problems. The literature on the use of GAs for parameter estimation and structure in artificial neural systems shows that GAs produce networks whose topology pretty often does not match the expectations

of the humans who set up these problems. This gets back to Wilder-Smith's assertion that "intelligence does things differently". Wilder-Smith was right that differences in the products of intelligence and Darwinian process exist, but wrong in the inference that living organisms demonstrate the pedigree of intelligence. The quirky, odd, and just plain weird ways in which organisms are put together speaks much more clearly of a process like GAs than it does of intelligent planning.

'The failure of experimental tests of Darwinian hypotheses invalidate those hypotheses. Other hypotheses formerly abandoned due to the existence of the untested, and now falsified, Darwinian hypotheses must now be re-evaluated. Specifically, Paley's "argument from design" is rehabilitated and must be viewed as being valid.':

The "failure", as mentioned above, was inconclusive and later shown to not be a failure at all. Since the Darwinian hypotheses were not falsified, no compunction for re-examination of Paley's argument accrues.

'Information theory and the argument from design imply that humans can accrue only a limited and partial knowledge of the universe.':

This assertion is inconsistent with the axiom that the phenomena of the universe can be comprehended by humans. This is fundamental to scientific research. No researcher can approach phenomena under study with the belief that the phenomena cannot be comprehended. Since all phenomena are appropriate for study, the universal nature of this axiom is established. Note that this axiom is revealed in a bottom-up rather than a top-down fashion, in accordance with the principle that science is defined by its practice.

I should clarify what I mean by the axiom of comprehensibility. In many ways, it is a precursor to what some have termed "the scientific attitude". Briefly, the axiom of comprehensibility holds that for any particular phenomenon approached as a topic of scientific research, those engaged in the research hold an expectation that the research will yield comprehension of the phenomenon, either in whole or in part. This is simple to state, and as with most axioms, appears trivial when plainly stated. Yet the rejection of this axiom leads to a variety of non-scientific and even anti-scientific stances.

The axiom of comprehensibility represents a radical change. It is a definite change from various and sundry doctrines of mysticism, including the one formulated by Wilder-Smith above. The radical part comes from the recognition that it has underlain scientific progress for several centuries and has yet to be fully assimilated. Many people today, like Wilder-Smith, specifically reject the axiom of comprehensibility because they believe it denies any reality to theism, mysticism, or even mystery. The promulgation of supernatural causation as if it were properly in the domain of science is not merely a mistake, but rather the poisonous intrusion of an anti-scientific concept.

The acceptance of an abridgement of the domain of science inhibits the exploration of phenomena and produces no information.

In summary, Wilder-Smith's premise that Darwinian hypotheses failed to provide adequate "rules" for producing algorithms capable of producing new information and were factually in contradiction to established tenets of information theory was false, and his conclusions drawn therefrom are invalid. Wilder-Smith's repudiation of the stubbornness of biologists confronted by mathematicians at the Wistar conference turns out to be merely embarrassing, for the biologists were absolutely correct and the mathematicians wrong in their assessments.

In this case, we find that a forcefully worded claim of falsification of Darwinian mechanism coupled with concomitant rehabilitation of supernatural causation failed. The failure of the claim stemmed from the acceptance of a certain few failed experiments as demonstrating conclusively that all experiments in the same vein would fail. Because of the universal nature of Wilder-Smith's claim, its downfall was demonstrated by the success of other computer simulations of Darwinian processes.

PHILOSOPHY AND THE PRACTICE OF SCIENCE

The philosophical underpinnings of science are, for the most part, invisible to its practitioners. While being schooled in scientific disciplines, it is relatively uncommon for students to be explicitly exposed to the philosophy of science. The practice of science is mostly conducted by people who have neither a grounding in or an appreciation for epistemology, and who may even find consideration of the topic unworthy of their attention. Even the much vaunted "scientific method" rarely receives a cogent explanation to the student at the secondary school level, and may be entirely absent from the curriculum of graduating college students. A mystery worthy of exploring is how science continues to perpetuate itself without an efficient and explicit pedagogy.

The solution is that many successful scientists learn by example and by doing science. In most cases, explicit lessons in the scientific method become superfluous because the neophyte scientist must undertake research directed by others, whether during their course work in school or in entry-level research positions. The structure of current scientific research holds many parallels to the medieval guild system, with the apprentice (read "undergraduate", "graduate", or "intern"), journeyman (read "graduate" or "postdoc"), and master (read "faculty", "researcher", or "scientist") levels. It is uncommon that one may find a master level scientist (one who obtains grants as a principal investigator in his or her own name) who has not completed one or both of the lower levels. The course work of science curricula is, generally speaking, an insufficient basis for the actual practice of science. That comes from getting involved in the practice of science. Actually practicing science is unlikely to enhance the practitioner's grounding in the philosophy of science.

Still, this persistent and pervasive gap in the knowledge of scientists concerning the philosophical basis of scientific endeavor cannot be viewed with equanimity. A proper understanding of what science is and does should be part of every citizen's education, especially as our society becomes more and more dependent upon technology. Miscomprehension of what scientists do hampers scientists in the long run, as public funding administration may then evaluate proposals using a skewed or even anti-scientific viewpoint. The objections of the late Senator Proxmire to various funded research studies in basic science demonstrate this point nicely.

In education as well as practice, the axiom of comprehensibility should be emphasized as a wellspring of scientific endeavor. Education in science should be well-rounded, to include not only the philosophical basis of scientific methodology, but also the flavor of how actual scientific research is conducted. An important part of this would include the subject of error and fraud in science, which illustrates the importance of inter-subjective experience. The history of science, including examples such as Wilder-Smith's failed rehabilitation of Paley, is also important to demonstrate why the axiom of comprehensibility is critical to doing science.

It is possible that the axiom of comprehensibility is false. There may exist some phenomenon which will never be comprehended by humans even after intense study. However, no such counterexample has yet been found, and we have no good reason to suppose that such a counterexample is likely to be found. (Some might interject here that Godel's incompleteness theorem as an indication that comprehensibility is limited. However, this does not bear upon the issue. Science can only deal with phenomena which exist. What the incompleteness theorem states is that certain concepts, such as a set of axioms sufficient to establish algebra, will not be both complete and consistent. In other words, the theorem tells us what phenomena will not exist, and not that some existing phenomenon is incapable of comprehension.) In many cases, we have examples where previously baffling phenomena have been rendered comprehensible. Asserting that the axiom of comprehensibility is false is a sterile stance. Such an assertion represents an abandonment of further study on some set of physical phenomena, rather than setting up another avenue of inquiry. Even if some few counterexamples to the axiom were to be found, its general utility would indicate that it should be tested by scientific inquiry in each case, not merely assumed to also be false for other cases.

Wilder-Smith rejected the axiom of comprehensibility based upon his view that the fact of supernatural causation of the phenomena of the universe implied a limitation on human comprehension of those phenomena. In a curious inversion of Wilder-Smith's logical argument for rejection of the axiom of comprehensibility, Phillip Johnson stated the following:

"[...] To theists, on the other hand, the concept of a

supernatural Mind in whose image we are created is the essential metaphysical basis for our confidence that the cosmos is rational and to some extent understandable. Scientific naturalists insist, paradoxically, that the cosmos can be understood by a rational mind only if it was not created by a rational mind. (By such reasoning, a computer ought to be an impenetrable black box.) [...]" (Johnson 1993, p.164)

David Livingstone's description of various and sundry theists of the nineteenth century supports the notion that the metaphysical principle of creation yielded a bounded expectation of comprehension of phenomena, not an unlimited or universal expectation (1987). William Henry Dallinger, for example, is quoted to the effect that God's Creation implies a "'final purpose' too great for man to see" (Livingstone 1987, p.97). Johnson's "to some extent understandable" is an unnecessary metaphysical crippling of scientific endeavor, not an essential grant of license as he implies. Also, Johnson does not actually establish paradoxical inference on the part of "scientific naturalists", as reference to Wilder-Smith's argument reveals. Wilder-Smith argued that a superhuman intelligence was required for design of the universe and its components, and that of necessity the lesser intellectual capacity of humans would fail to comprehend some of its works. Johnson conveniently leaves out the critical modifiers in his characterization of his "scientific naturalist"'s stance: Scientific naturalists insist that the cosmos can be understood by a rational human mind only if it was not created by a rational superhuman mind. And as we have seen in Wilder-Smith's writings, it isn't even the scientific naturalists who are making the assertion of a limitation on comprehension; it is instead the theists who have promulgated this doctrine and who have insisted that supernatural causation of phenomena precludes complete comprehension of those phenomena by humans. Scientific naturalists need not do more than note that the argument is properly credited to theists who reject the axiom of comprehensibility. Johnson's parenthetic comment in the quote above is a cheap shot based upon a mischaracterization: computers are designed by human minds, not superhuman ones, and are thus comprehensible to human minds. The targets of Johnson's critique, scientific naturalists, have done nothing "by such reasoning" as was attributed to them. While the subjective appreciation of a role for supernatural causation may be important to personal fulfillment, it does not afford a basis for objective knowledge, nor can it be counted as a means of comprehending the universe in a scientific manner. As Popper noted, objectivity can only be approximated by inter-subjective experience (Popper 1959, p.44). However, supernatural action is not considered to be amenable to test in the Judeo-Christian tradition. Similar initial conditions do not lead to similar outcomes across observers, nor to reliable repetition in the same observer.

I will connote "naturalism" as "proposing only natural mechanisms for physical phenomena" rather than

"asserting that only natural mechanisms have existence". It is easy enough to define terms such that they become useless to anyone, which is how I view those who would make "naturalism", "scientism", and "scientific materialism" all synonymous. Science is incompetent to examine those conjectures which cannot be tested in the light of inter-subjective experience or criticism. The assertion that "only natural mechanisms have existence" is equivalent to the claim that "no supernatural causes exist". That is an example of proving a negative, and can only be regarded as a statement of faith, since it requires omniscience on the part of the claimant.

The term "supernatural mechanism" is an oxymoron. Humans are not privy to the mechanics of supernatural action, nor can they be. The most that can be hoped for is to demonstrate "supernatural causation". Even this appears chimerical, for the following two reasons. First, humans cannot establish a supernatural cause by experimental reproduction of that cause. No human is capable of producing a supernatural cause. Second, natural and supernatural causation are confounding: suspected supernatural causation may simply be due to currently indiscernible natural causes. Because of the confounding nature of the interaction, the only way to establish supernatural causation is through the elimination of all natural alternatives. This is simply another case of proving a negative, which is an intractable problem. That is, asserted supernatural causation logically requires an exhaustive study of possible natural causes of the phenomenon in question, which is counter to the usual desired outcome of such assertions.

Assertions of supernatural causation do nothing to aid human comprehension of physical phenomena. If Wilder-Smith had had his way, genetic algorithms would never have been attempted again, and a fruitful technique would have been denied to researchers and engineers everywhere. Only proposed mechanisms speak to comprehension, and theists do not box in deities with mechanism. Even attempting to assert supernatural causation for some phenomenon necessitates more examination of that phenomenon in light of natural explanation, not less. Enterprising science needs naturalism if it is to be considered a means of advancing knowledge of physical phenomena.

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