MODERN ASTRONOMY, THE BIBLE, AND CREATION

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SUMMARY

This the web version of a handout is intended for Christians and others interested in Bible and science questions (particularly astronomical ones). In it I give my responses to some of the questions I am most frequently asked on the subject of the Bible and modern astronomy. I start out by emphasizing that many scientists and philosophers have strong religious beliefs and I give some quotes from famous scientists and philosophers. I list, and briefly discuss, some of the main theological interpretational viewpoints of the creation stories in Genesis. It is explained that there are more than just two extreme views on the origin of the universe and that the majority of scientists who are Christians adhere neither to the view that the Bible is irrelevant to the earth's origin (which exponents of atheistic evolution claim) nor the view that God made the earth essentially as it now is in six 24-hour periods about 6000 years ago (the "young earth creationist" position.) The origin of Bishop Ussher's date of creation is explained and the question of "days" in Genesis 1 is discussed. Examples of where modern astronomy is supporting the details of Genesis 1 are described. A list of suggested readings for those who wish to read more about Christianity, the Bible, and some of the scientific issues is appended.

INTRODUCTION

At home we have a highly useful one-volume encyclopedia, the New Columbia Encyclopaedia (1975 edn.). It is a wonderful book because it has most topics in it that we want to look up, and it has neither too much nor too little information. Now I'm not advocating the divine inspiration of encyclopaedias, but I thought it would be interesting to see what it said on two topics: "God" and "Atheism". The entry for God is 24 cm long (a bit more than most people get.) It gives the names of God, discusses concepts of God, and ends with listing the classical arguments for the existence of God. There are cross-references to other articles ("Trinity", "Religion" etc.). Now let's look at the entry for "Atheism". This is so short that I will quote it in its entirety:

"Atheism, denial of the existence of God or gods and of any supernatural existence, to be distinguished from AGNOSTICIS, which holds that the existence cannot be proved. The term atheism has been used as an accusation against all who attack established orthodoxy, as in the trial of Socrates. There were few avowed atheists from classical times until the 19th cent., when popular belief in a conflict between religion and science brought forth preachers of the gospel of atheism such as Robert O. Ingersoll. There are today many individuals and groups professing atheism."

Notice how short the article is! About half the article is taken up defining the term (the article on agnosticism is about the same length). The rest of the article is a short history. Notice that there are no "proofs" or arguments offered for atheism, just a reference to "a popular belief in a conflict between religion and science." The coverage by our 20-volume World Book encyclopaedia is similar. No logical or philosophical arguments are offered because there aren't any! If you've taken a philosophy class, quite likely, you spent a fair bit of time discussing various arguments for the existence of God, and different viewpoints, but you might not have noticed a lack of arguments for atheism. As a number of people have noted, to be an atheist is to take a major leap of faith.

In these notes I want to focus on this question of "the popular belief in a conflict between religion and science". These notes have three parts: first I want to give you, mostly in their own words, some statements by some of the major figures who have given us our modern view of the universe. Then I want to focus on the first chapter of Genesis, because it is in the question of origins that the conflict between religion and science is often considered to be greatest. First, I will present you with some of the major interpretive views of Genesis and then, for the final part of the notes, I will go through the first chapter of Genesis in the light of modern astronomy. At the end of these notes you will find an extensive recommended reading list, and references in my notes are mostly to books on this list.

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SOME STATEMENTS BY GREAT SCIENTISTS

Part of the "popular belief" alluded to in my introduction is that great scientists are atheists or at least uninterested in religion. Let's see what some of main figures in the development of astronomy had to say for themselves. If you're unfamiliar with astronomy, these particular astronomers were all major figures in the development of astronomy.

Nicholas Copernicus - the person responsible in modern times for the idea that the earth orbits the sun; Copernicus was a prominent churchman:

"[The world] has been built for us by the Best and Most Orderly Workman of all"

He pursued his research (he said) "loving duty to seek the truth in all things, in so far as God has granted that to human reason." [See Hummel 1986, "The Galileo Connection"]

Johannes Kepler - the man who discovered the laws of planetary motion. A devout Lutheran and diligent student of the Bible. He was the person who discovered that Jesus was not born in 1 AD.

"I believe Divine Providence intervened so that by chance I found what I could never obtain by my own efforts. I believe this all the more because I have constantly prayed to God that I might succeed if what Copernicus said was true."

On his deathbed he said: "[my salvation lies] only and alone on the services of Jesus Christ." [See Hummel 1986].

Galileo Galilei - the first person to publish astronomical results obtained with a telescope. Opened up a whole new realm of astronomy. Many discoveries. He acquired many scientific enemies who eventually got even by bringing him before the inquisition they couldn't win on scientific grounds. It is important to understand that Galileo's appearance before the inquisition was not a simple case of "the church against progress in science". The Roman Catholic Church was in fact quite divided over the issues in the Galileo case. Galileo never blamed the Roman Catholic Church for what happened but blamed his fellow university professors instead. Here are some of his views on science and Christianity:

"The Holy Bible and the phenomena of nature proceed alike from the Divine Word...God is known...by Nature in His works and by doctrine in His revealed word."

"The Bible teaches how one goes to Heaven, now how the heavens go."

Sir Isaac Newton - Derived the theory of ("Newtonian") gravity. Made the first reflecting telescope. Co-inventor of calculus. Many other contributions to science. Newton was a complex and unappealing character and he was unorthodox in his beliefs, but he wrote more on Biblical subjects than on everything else he did all put together. He published valuable contributions to religious knowledge (esp. on interpreting Biblical prophecy).

"There are more sure marks of authenticity in the Bible than in any profane history."

[Biblical prophecy was not intended by God to] "gratify men's curiosities by enabling them to foretell things" but rather that: "after they are fulfilled, they might be interpreted by events...The events of things predicted many ages before, will then be a convincing argument that the world is governed by Providence."

One of Newton's views of his own greatest published work he expressed as follows:

"When I wrote my treatise about our Systeme, I had an eye upon such Principles as might work with considering men for the belief of a deity & nothing can rejoice me more than to find it usefull for that purpose." [See Hummel 1986]

Sir William Herschel - discoverer of the planet Uranus, but more famous among modern astrophysicists as the father of stellar and galactic astronomy.

"All human discoveries seem to be made only for the purpose of confirming more and more strongly the truths in the sacred scriptures." [Quoted by H.H. Halley 1965, "Halley's Bible Handbook" 24th ed., p.19]

Albert Einstein - developer of the theory of relativity. He was not a man of orthodox beliefs, but he believed that science and religion needed each other and that "science without religion is lame". He also said:

"Everyone who is seriously involved in the pursuit of science becomes convinced that a spirit is manifest in the laws of the universe--a spirit vastly superior to that of men..." ["Albert Einstein: The Human Side", Princeton University Press]

"The highest principles for our aspirations and judgments are given to us in the Jewish-Christian religious tradition." [Address to Princeton Theological Seminary, May 19, 1939. Published in "Out of My Later Years" Philosophical Library, 1950]

"What is the meaning of human life, or of organic life altogether? To answer this question at all implies a religion. Is there any sense then, you ask, in putting it? I answer, the man who regards his own life and that of his fellow creatures as meaningless is not merely unfortunate but almost disqualified for life." ["The World as I See It", Philosophical Library, 1949]

"Being a lover of freedom, when the [anti-Nazi] revolution came to Germany, I looked to the universities to defend it, knowing that they had always boasted of their devotion to the cause of truth; but, no, the universities immediately were silenced. Then I looked to the great editors of the newspapers whose flaming editorials in days gone by had proclaimed their love of freedom; but they, like the universities, were silenced in a few short weeks. Only the Church stood squarely across..."
the path of Hitler’s campaign for suppressing truth. I never had any special interest in the Church before, but now I feel a great affection and admiration because the Church alone has had the courage and persistence to stand for intellectual truth and moral freedom. I am forced thus to confess that what I once despised I now praise unreservedly.” [Interview in Time magazine, Dec. 23, 1940, p. 38]

The list could go on with quotes from many more great astronomers and physicists (such as Michael Faraday, James Clerk Maxwell, Sir Arthur Eddington, Sir James Jeans, Heber Curtis, and Henry Norris Russell to name but a few) and be continued down to the present day (with men like Allan Sandage), but it’s always easier to refer to someone as a “famous scientist” when they’ve been dead a while! For an extensive series of short highly readable spiritual and scientific biographies of scientists of the past in various fields see “Scientists of Faith” by Dan Graves. Moving beyond astronomy, the following (more recent) quotes by two physicists are noteworthy:

Henry Margenau - former president of the American Association for the Philosophy of Science, a physics professor at Yale University and former editor of Reviews of Modern Physics (Margenau got his start in physics at the University of Nebraska):

“It is often said, and widely believed, that scientists on the whole are anti-religious or, at least, are not interested in religion. I believed that for a long time too. But no longer. ...as I perceive it, the fact is, the scientists, the physicists at least, who have been most active, most successful in developing the quantum theory and further innovations in physics, are very interested in religion. If you consider scientists of the type of high school teachers or grade school teachers or Carl Sagan, you find that, yes, there is a lack of interest. Quite a few of them are anti-religious. But, if you take the outstanding physicists, the ones who have done the most to advance modern physics, especially Heisenberg, Schrödinger, Dirac, you will find them all interested in religion. All these men were intensely interested in religion.” [In “The Intellectuals Speak out about God”, Chpt. 3, ed. R. A. Varghese, 1984, p. 45]

According to science historian Frederic B. Burnham, in an editorial in the Los Angeles Times, (Saturday, May 2, 1992, pp. B6-B7), the community of scientists now considers the idea that God created the universe “a more respectable hypothesis today than at any time in the last one hundred years.”

Robert Griffiths (a physics professor at Carnegie Mellon University and winner of the Heinemann prize in mathematical physics):

“If we need an atheist for a debate, I go to the philosophy department. The Physics department isn’t much use” [interview in Christianity Today, April 3, 1987, p. 18]

SOME QUOTES FROM SOME PHILOSOPHERS

It is worth adding that Prof. Griffiths might have trouble finding his atheist for a debate in some philosophy departments too!

The Society of Christian Philosophers, with about a thousand members, is the largest special interest group in the American Philosophical Association (Robert Audi, the former Charles Mach Distinguished Professor of Philosophy at the University of Nebraska was a president of the Society). Here are some quotes from some noted contemporary philosophers:

Bernard J. F. Longeran Before his death in 1984 Longeran was described by Time magazine as “considered by many intellectuals to be the finest philosophical thinker of the 20th century”. Over one hundred and fifty doctoral dissertations have been written on his work! He has also had the distinction of becoming the first philosopher to have witnessed, in his lifetime, an entire conference of fellow-philosophers convened solely in order to study his thought.

“I do not think it difficult to establish God’s existence” [“The Intellectuals Speak Out about God”, ed. R.H. Varghese, 1984, Regnery Gateway, p. 180 - the section of this book on Philosophy includes discussion with two other past presidents of the American Philosophical Association (quoted below) and is excellent (but not light-weight reading!)]

Alvin Plantinga (a past president of the American Philosophical Association). Writing about one of the classical arguments for the existence of God, he wrote that it

“...provides as good grounds for the existence of God as does any serious philosophical argument for any important philosophical conclusion.”

[“The Intellectuals Speak Out about God”, p.191]

William Alston (another past president of the American Philosophical Association)

“...think that the Naturalist who is convinced that there isn’t anything beyond what we can discover through sense-perception and what science tells us about, is simply shutting himself off from some of the ways we have to find out what there is.” [“The Intellectuals Speak Out...”, p. 158]

John E. Smith (another past president of the American Philosophical Association) was asked how he viewed some popular

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scientific writers such as Carl Sagan and the late Isaac Asimov presenting emphatically mechanistic (atheistic) views. He replied:

"Well, I think they are being dogmatic and the tide is against them... There will always be those who try to reduce the world to materialistic proportions. But then... it is... a phenomenon worthy of study to find people animated by the purpose of showing that purpose is an illusion."  ["The Intellectuals Speak Out..." p. 161-162]

Kurt Gödel. It is also noteworthy that the most famous mathematical logician of the 20th century, Kurt Gödel, author of the famous "Gödel's incompleteness theorem" (1931) on the limits of mathematical proof, believed in the existence of God on the basis of a logical proof of the existence of God. The proof can be found in full in the biography "Reflections of Kurt Gödel" by H. Wang (1987, MIT Press: Cambridge, Mass.)

WHAT THE BIBLE SAYS ABOUT CREATION

It is in the area of creation that the most fuss is made about possible conflicts between the Christianity and science. The rest of this handout looks at the astronomical issues here.

First, before arguing (from any side) about origins and what the Bible says, it is important to actually read for oneself what the Bible says! The best-known passage is Genesis 1:1 - 2:3. What is perhaps less well known is that there is a second description of creation (in a different order) in Genesis 2:4-7. The difference in order suggests that we should not get too "hung up" about the order in Genesis 1.

There are many other passages in the Bible speaking about creation. I have a companion nine-page handout of over a hundred of these passages. Some of the ones I'd suggest looking up are John 1:1-3, John 1:10, Colossians 1:16-17, Hebrews 11:3. From these one learns that Jesus was involved in the creation and that more things than just our visible universe were created (at the very least that has to include the mysterious invisible "dark matter" astrophysicists are looking for which might make up 90% of the mass of the universe). Job 38:4-11 is an interesting passage because of the poetic imagery used. It speaks of the "bolts" on the "doors" of the sea. I've never heard any Bible interpreter believe that the sea literally has a bolt! This should caution us into realizing that Genesis 1 is a quasi-poem and being aware that there might be figures of speech (the Bible abounds in these: who believes that because Jesus said, in John 10:9, that He is the door, that therefore He has hinges on his side?).

DIFFERENT INTERPRETATIONS OF GENESIS

I would like to say emphatically that there are not just two interpretations of the origin of the universe: an (atheistic) "evolutionary" one and a Biblical "Creationist" one! It is important to realize that there are a wide variety of interpretations held by Christians. If you look at the writings of well-known evangelical Christian writers (such as F. F. Bruce, Francis Schaeffer, C. S. Lewis, R. C. Sproul, etc.) you will find that all of these people agree on the foundation Christianity - the person and work of Jesus Christ - but they do not agree on the exact interpretation of Genesis. For controversial issues St. Paul offers important guidelines in the 14th chapter of his letter to the Romans. First, in Romans 14:5b he says, "Let each person be fully convinced in his own mind". Christians are to use their minds! From this chapter of Romans we can see that true believing Christians are going to be of different minds over some topics. But verse 3 of the same chapter commands Christians not to regard fellow believers who are convinced of other viewpoints on non-essential doctrines with contempt. Rather they should "...pursue the things which make for peace and the building up of one another" (verse 19). In approaching a controversial topic I think there is an important need for humility.

Here then is a list of just some of the differing interpretations of the start of Genesis. The positions are not independent and there can be a lot of overlap (e.g., someone emphasizing the "Historico-Artistic" interpretation might hold to all or parts of any of the other views).

"God made everything pretty much as it is now in six 24-hour days about 6000 years ago" - the so-called "Creationist" position (a bad name! - 1, and many writers on the subject prefer the name "Young-Earth Creationist" for this position). This is the position of the Creation Research Society (CRS), the San Diego based Institute for Creation Research (ICR), and a number of other "Creation Science" organizations. I have a lot of respect for people who hold this view because they are strongly committed to the Bible, but I don't believe it is the interpretation the Bible requires of itself, and it certainly clashes head-on with science. This viewpoint is something of an "American" view and has been much less common among Christians in Europe. The "Creationist" movement as we know it originated in the USA among Seventh Day Adventists (see the detailed history by R. L. Numbers, "The Creationists", 1993, University of California Press, $15). To get around the apparently overwhelming scientific claims for an old earth, the ICR holds to an "appearance of age" theory where the evidence for an old earth is an illusion created by God. Many challenge the theology of this theory since it requires God to be deliberately deceptive, while the Bible says, "God cannot lie". There are many books that discuss the biblical problems with the Young-Earth Creationist interpretation (see bibliography; "The Fingerprint of God" has a good section on this).

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"Day-Age Theory" - interprets the days of Genesis as geological ages.

"Gap Theory" - posulates that there is a gap between the initial creation (in Genesis 1:1) and subsequent events (starting in Genesis 1:2). The gap is presumably billions of years long.

"Days of Revelation Theory" - posulates that the 6 days of Genesis 1 were the six days over which God revealed things to Moses.

"Theistic Evolution" and "Progressive Creation". These are perhaps the most popular positions among scientists who are Christians. They say that things happen the way science says they do, but that God is still in charge and able to intervene as he wills. There are many theories in these categories. Opinions differ as to when and how God intervenes. "Intelligent Design" positions (see below) belong in this category. Theistic evolution is pretty much the official position of the Roman Catholic church.

"Concordist Viewpoint" - Emphasizes areas in which the Bible and science agree and assigns different (Biblical or scientific) explanations to different things.

"Genesis is purely theological". (i.e., it is not necessarily meant to relate what actually physically happened). This is a broad category covering a wide range of positions. I think this position takes a too low view of the Bible and I personally believe that the first few chapters of Genesis are vitally important theologically, but that there is more to them than that.

"Historico-Artistic Viewpoint" - emphasizes that we have to realize that the Genesis was addressed to people 3400 years ago in a form and in descriptive terms they would understand. Moses wouldn't have got very far if God had quoted from a modern introductory astronomy text to him! ("Say, God, what's a quark?"). A senior physicist, who had been chairman of one of the largest physics departments in the US (and who was, incidentally, not someone with a high view of the Bible), once said to me, "if we put what we now believe to be true about the origin of the universe into poetic language someone would have understood 3000 years ago, we would come up with something very much like Genesis 1 & 2". The historico-artistic viewpoint would also emphasize that Genesis 1 is in the form of a poem. It has a very definite literary structure. Phrases and patterns of words repeat (e.g., phrases such as "Then God said...and it was so" or "...and God saw that it was good" or "and there were evening and morning..." But we must be careful to note that whether Genesis 1 is poetry or prose has nothing to do with whether it is an actual very literal description of what happened or whether it is allegorical or something. We must not make the distinction prose = fact; poetry = fiction.

"The Answers are not in yet". This is part of my own viewpoint. I believe that God has not yet revealed everything to us in the Bible (see Deuteronomy 29:29 and 1 Corinthians 13:9-10,12) and I know that we don't know all the answers in science yet.

"Humanistic Evolution" this non-Christian approach solves the problem by regarding the Bible as a bunch of myths and ignoring it. However, the Bible is actually very different from ancient middle-eastern myths and is a historical book, well confirmed by archaeology (see reading list, especially Josh McDowell's "Evidence that Demands a Verdict"). The Genesis account is sometimes compared to the Babylonian creation epic, the Enuma Elish, found on tablets in the Assyrian Emperor Ashurbanipal's library (667-626 BC) but they are fundamentally very different. The Enuma Elish is about gods and goddesses bearing children, getting angry with each other, wanting vengeance and killing each other. The difference between this obvious myth and the Genesis account is most striking.

The main controversy has been between people at the two extremes (young earth creationists and humanistic evolutionists). "Creationists" attack the science of "evolutionists". I believe that this sort of attack is very bad both scientifically and theologically. The "scientific" explanations offered by "creationists" are mostly very poor science and I believe this sort of thing actually hinders some (many?) scientists becoming Christians. It is true that there are significant scientific problems in evolutionary theory (a good thing or else many biologists and geologists would be out of a job and that these problems are bigger than is usually made out in introductory geology/biology courses, but the real problem with humanistic evolution is in the unwarranted atheistic assumptions and extrapolations. It is the latter that "creationists" should really be attacking. There are quite a few books which do a good job of attacking these unwarranted assumptions and extrapolations (e.g., the books by Phillip Johnson).

While discussing controversies and interpretations of Genesis 1 should mention something that is not an interpretation of Genesis: what is called "Intelligent Design". This movement, which is often erroneously confused with young-earth creationism, is simply exploring the question of what evidence there is in the universe for design by an intelligence. This is a general, non-religious question (although with obvious religious implications), and there is no opinion on the interpretation of Genesis.

Also worth mentioning under different viewpoints is the Islamic creationist movement in the Muslim world. The

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leading spokesman of this is the Turkish writer, Harun Yahya, whose work is widely read in the Muslim world. Yahya is non-committal about the age of the earth.

Although I’m writing this handout primarily for Christians, Genesis is, of course, a Jewish book. Jewish creationism includes a continuum of views about creationism, the origin of life and the role of biological evolution that I cannot cover here.

It is worth noting that a number of important figures of antiquity interpreted the creation days of Genesis I as long periods of time. These include the famous 1st century Jewish historian Josephus, and many important early Christian writers including Irenaeus (a martyr in the 2nd century), Origen (3rd century), Basil the Great (4th century), Augustine (5th century), and Thomas Aquinas (13th century) [see “The Fingerprint of God”, and especially “Creation and Time” by Hugh Ross, for references]. This is significant because none of these Bible interpreters of antiquity can be said to have shaped their scriptural views to accommodate contemporary scientific views for an old earth, since this scientific evidence dates only from the 19th century.

WHAT HAPPENED BEFORE CREATION?

Before starting in at the beginning of Genesis there is a common question that is worth addressing: “What happened before the beginning?” St. Augustine (354 – 430 AD) in his famous Confessions (his autobiography) quotes an old joke: “What was God doing before he made heaven and earth?” answer, “Making Hell for people who pry into mysteries like that!” (Confessions, Book XI, Canto 12; Augustine then goes on to have a profound discussions of the nature of time). The Bible does say what was happening before creation (John 1:1-2; John 17:24; John 17:5; Ephesians 1:4; 1 Peter 1:20; Titus 1:2). Look those passages up if you want to know the Biblical answer! The book “Genesis in Time and Space” by Francis Schaeffer has a particularly good discussion of the theology of this. I will spend the remainder of this handout going through the first chapter of Genesis verse by verse in the light of modern science.

YES, THERE WAS A BEGINNING

Genesis starts: “In the beginning...” This is an important and powerful phrase because modern astronomy says very strongly that there was a beginning. This is implied by the expansion of the universe (“Hubble’s law”) discovered in the late 1920’s. The expansion implies that just under 14 billion years ago (see below) everything was in the same place. This time is commonly referred to as the “Big Bang”.

The theistic implications of the Big Bang were immediately recognized (by Einstein, for example – see Ross’s books in bibliography). So uncomfortable was this to many atheistic cosmologists that they went to, and continued to go to, considerable lengths to get around a start to the universe. Hugh Ross in his books gives a long list of theories meant to circumvent an origin to the universe. One theory I will mention here, popular 30 years ago, is the “Steady State Theory” which suggested continuous creation of matter to maintain a constant density in an expanding universe. The authors of this theory made it clear in their writings (see Ross for references) that their motivation was to do away with a moment of creation and what it implied. The “Steady State” theory was shown over 40 years ago to be incorrect when counts of radio sources showed that the universe was changing with time. In 1965 the remnant radiation from the Big Bang was discovered (the “microwave background”) which provided powerful support for the Big Bang theory and gave the coup de grace to the Steady State theory.

People often ask if the Big Bang was merely preceded by a “Big Crunch” or a “Big Bounce” of a previous universe. This theory is called the “Oscillating Universe” theory. Theoretical work over the last half century argues that on what are called “thermodynamic grounds”, this attractive idea cannot work (“The Impossibility of a Bouncing Universe”, Guth, A. H. & Sher, M, 1983, Nature, 302, 505; see Ross’s books for additional references and discussion). As Ross puts it, “Far too much of the energy of the universe is dissipated in unreclaimable form to fuel a bounce. Like a lump of wet clay falling on a carpet, the universe if it did collapse, would go splat!” [p. 105 of “The Fingerprint of God”] Modern observational cosmology is making this discussion moot, however, as the latest results now strongly point to an infinite universe in which the expansion is actually speeding up.

WHEN WAS THE BEGINNING? I: WHERE DID “4004 BC” COME FROM?

Not from the Bible! The 4004 BC date originated with Irish scholar James Ussher (1581 – 1656). For an excellent article on Bishop (or Professor) Ussher see Sky & Telescope magazine, November 1981, p. 404 (400th anniversary of his birth). What Professor Ussher did was very scientifically respectable for his day (Kepler and Newton did it, for example). In fact, lots of people attempted to get dates of creation from the Bible. Alphonse des Vignolles in 1738 (writing what can be regarded as the first “review article” on the subject) claimed to have collected over 200 different dates from Jewish and Christian sources ranging from 3483 BC to 6984 B.C. (– all supposedly based on the Bible!) For example, the traditional Jewish calendar starts in 3760 BC. The reason why Ussher’s date of creation became particularly well known is that some

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unknown person included his dates in the margin notes of a printing of the Authorized ("King James") Version of the Bible.

While it is often believed that such dates are derived by adding up ages in the genealogies in the Bible and the reigns of kings, in actual fact, people's ages and king's reigns are often not given so people have to make pure guesses! Ussher got his date by assuming average reigns and life spans and finding when the autumnal equinox fell on a Sunday (people believed that the universe had to be made with the sun in a special place; Kepler had favored the summer solstice; Ussher had favored the autumnal equinox since there were fruit in the Garden of Eden! – an obvious British northern hemisphere bias!). Such things are clearly not "based on the Bible".

A more serious problem is that if you inter-compare genealogies in the Bible you discover that there are large gaps in them. If you compare 1 Chronicles 6:1-13 with Ezra 7:1-3 you will discover that Ezra omits 6 generations in verse 3. Another example of missing generations is Matthew's genealogy of Jesus (Matthew 1:17). In verse 8 Matthew omits the names of three kings who can be found listed in 1 Chronicles 3:11-12. In both of these specific examples I have given, we have someone described as "begetting" someone (to use the King James word) who is not their son, but some generations later. The Greek word used by Matthew is also used elsewhere in the New Testament to describe non-genetic relationships. The important point is that the Bible does not intend for a genealogy to be used as a chronology! (Its purpose is to show someone's lineage). Note, in particular, that the Bible itself never adds up the ages and reigns.

With these considerations one can see that an age of 13 or 14 billion years (say) CANNOT BE EXCLUDED BY THE BIBLICAL GENEALOGIES.

HOW LONG DID IT TAKE?

1. What is Meant by a "Day"?

The Hebrew word for day (Yom) has the same three meanings in the Bible as in English usage: the time when the sun is above the horizon and it is light; a period of 24 hours; and a more general period of time (“in so and so's day”). The very first verse in the Bible which uses the word day (Genesis 1:5) uses two meanings of the word (the first two meanings) and we only have to go as far as Genesis 2:4 to find the third meaning. The allowable interpretations of the word “day” do not require a 144 hour creation. The Hebrew words bager (morning) and oreb (evening) also have a number of meanings. The fact that the Jews adopted a seven day week is sometimes brought up as an argument for a six 24-hr period creation, but, as Hebrew scholar Gleason Archer puts it, this is no stronger argument for it than that the 8-day celebration of the Jewish Feast of Tabernacles is a proof that the wilderness wanderings of Moses occupied only eight days!

2. God's Timescale

II Peter 3:8 tells us that “with the Lord one day is as a thousand years, and a thousand years as one day”. Psalm 90:4 also says that a thousand years is like “a watch in the night” (about 4 hours).

HOW DID IT HAPPEN? – THE LANGUAGE OF GENESIS I, “FORM”, “MAKE” AND “CREATE”

The three Hebrew words used to describe God's actions in bringing the universe, the earth, life and mankind to approximately their present state do not rule out the possibility that natural processes were involved once the realm of nature was brought into existence.

The Hebrew word yatsar (translated “formed”) can be shown in numerous usages in the Old Testament to describe actions that were not instantaneous but accomplished by the use of natural processes (e.g., molding).

The Hebrew word asah (translated “make” or “do”) has widely varying subjects in the Old Testament and the action often involves natural processes and materials.

The Hebrew word bara (translated “create”) is a special word in the Bible which only has God as its subject. The word itself does not imply whether an action is instantaneous or not, but the same action is sometimes also described by the other two words (yatsar and bara). The three terms bara, asah, and yatsar are used in Isaiah 43:7 in parallel grammatical constructions where they are seemingly interchangeable.

WHEN WAS THE BEGINNING? II: THE EVIDENCE OF ASTRONOMY

The early years of the 21st century are golden years of cosmology. Thanks to new surveys and, in particular, to results from the Wilkinson Microwave Anisotropy Probe ("WMAP") published in February 2003, astronomers now confidently believe that the age of the universe is almost 14 billion years. This age is supported by quite a number of independent lines of evidence. These include: the expansion of the universe, the ages of the oldest star clusters in our galaxy (globular clusters), the cooling of white dwarf stars and nucleocosmochronology (a sort of "radio-active dating" of the

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BACK TO THE STORY...

"...the Spirit of God was moving over the face of the waters". It used to be thought that space was a vacuum and the idea of water in space would have been ridiculous. Modern radio astronomy, however, has shown that there is lots of water in space and that it is associated with the formation of stars like the sun and planets like the earth. We are also now fairly sure that the formation of the solar system took place in "darkness". (An old theory that the planets were formed by a passing star colliding with the sun was refuted in 1939). Infrared cameras on telescopes are letting us penetrate the darkness around newly-forming stars and see the disks from which planets like the earth will form. Comets are mostly water (ice) and the outer satellites in the solar system are predominantly water and ice.

I'm not sure of the interpretation of verses 3 and 4 of Genesis 1. The "light" in verse 4 makes more sense under current astronomical understanding as the light of the sun. Although it used to be thought that the sun is as old or older than the earth, recent investigation of the formation of stars like the sun suggests that the sun formed after the planetary system (by about 200 million years), but this is somewhat of a technical distinction since when astronomers talk about the "age" of the sun they are measuring from what they call the "zero age main sequence". Why should God in Genesis have made the same technical distinction as modern astronomers? Perhaps what verses 3 and 4 are referring to is the blowing away by solar radiation of the dark dust enshrouding the early solar system (to produce something a bit like the present day picture of the β Pictoris system). If that "light" is sunlight, the explanation of the later date for the appearance of the sun from the earth (verse 16) would be the clearing of the earth's initially cloudy atmosphere (the newly formed earth probably looked more like what Venus currently looks like). As soon as we have a rotating planet (albeit cloud-covered) exposed to sunlight, it is astronomically OK to speak of "morning" and "evening" before the sun becomes visible.

vv. 6-8. The description of the separation of the earth from water and things in space presents no problems.

vv. 9. "Let the dry land appear." A number of lines of evidence point to the newly formed earth being completely covered with an ocean with at most a few islands (for a review see Cogley and Henderson-Sellers 1984, Rev. Geophysics & Space Physics, 22, 131 "The Origin and Earliest State of the Earth's Hydrosphere"). The large continents as we now know them appeared later. Incidentally, we have also realized that much of the planet Mars was also under water.

vv. 11. "Let the earth sprout vegetation". At this point, as a self-respecting astronomer I'm inclined to throw up my hands and say "Yuk, biology!" (Biology is one of those subjects students say they take my classes to avoid!) However, so long as by the Hebrew word here we understand the origin of the "plant kingdom" we're doing OK in the order of things as we currently understand them (the unlikely reading "grass", however, would not fit in as grass appears to have come very recently in the earth's history).

vv. 14-19. "...lights in the expanse of the heavens..." Perhaps the simplest explanation is to say that this refers to the clouds clearing and the sky becoming visible. It seems to me that this is less likely to refer to the creation of a sun at this stage even though astronomers now think the sun is a little younger than the earth (see note on the relative ages of the earth and sun under discussion of verses 3 & 4 above). The best theory for the origin of the moon is that it resulted from a collision of a body with the earth after the earth had formed. This makes the moon younger than the earth, but I would personally favor the interpretation that verse 16 refers to the moon becoming visible from the surface of the earth. We also have a choice of interpretation for the appearance of stars in v. 16 (the word "stars" in the Bible includes what we now call planets as well). Again, what is described at the end of v. 16 could be the stars (and planets) becoming visible, but it is interesting to note that almost all of the stars we see in the sky have formed since when we believe life on the earth started! A check of a list of the 100 brightest stars, for example, reveals that they are all (astronomically speaking) "young" stars. The Pleiades star cluster, for example, is only 150 million years old (very recent geologically speaking).

vv. 20 onwards. The amount of biology gets worse and by Genesis 2:9 we're even getting into the social sciences! I will just end this little look at how science currently seems to fit in with Genesis 1, by noting that with the appropriate interpretations of the Hebrew words, the order of the origin of life forms, culminating in man, can be brought into reasonable (but not perfect) agreement with our modern scientific understanding. It is worth noting that Genesis does not always say "God created". In the case of "cattle and creeping things" God says "Let the earth bring forth...". To me this implies that life has been brought forth out from the material of the earth. Mankind is no exception to this as in Genesis 2:7 we are explicitly told that we are formed "of the dust from the ground". Although this is getting outside the realm of astronomy, it should be realized that, despite some popular claims to the contrary, science has no satisfactory explanation of the origins of life yet. Note that the question of the origin of life is a separate problem from the question of the validity of some theories of evolution. The evidence is very good (and gets stronger every year) that all life on earth descended (i.e., evolved from) from a common origin. But this only heightens the origin of life problem. A discussion of the current controversy over evolutionary theory and how Christians view them is beyond the scope of this handout, but reviews of books such as those of Phillip E. Johnson ("Darwin on Trial") and biochemist Michael J. ("Darwin's Black Box") will give you some of the flavor of the diversity of opinion of Christian biologists (and geologists).

Although I'm sidestepping biology issues, I do want to give one quote. It's by the Nobel prize winning neurobiologist and author of several noted books in the body-mind problem, Sir John Eccles: "We come to exist through a divine act. That divine guidance is a theme throughout our life; at our death the brain goes, but that divine guidance and love

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concluding. Each of us is a unique, conscious being, a divine creation. It is the religious view. It is the only view consistent with all the evidence. "["The Intellectuals Speak Out About God", p. 50]. This is probably a good place to state that I personally have no theological problem with the idea of God doing things in the ways described in modern theories of evolution (i.e., "theistic evolution").

In sketching out possible astronomical interpretations, I've focused on the order in Genesis 1. It should be noted again that the order of some of the events described in Genesis 2 is different from the order in Genesis 1, so (again) we should not get too "hung up" on the order of events.

CONCLUSIONS

What I've sketched above is just a series of possible interpretations of Genesis 1 & 2. The main point that I'd like to get across from doing this is that it is certain that there is a possible scientific explanation of most things, one cannot say "science disproves Genesis". Another point is that we do not have to take Genesis as something "just theological". It is quite likely that Genesis is describing physical things that happened in space and time in the history of our universe. Having said this, however, I must say again that I personally don't believe that anything like all the answers are in yet. I know, even from the limited experience of my career as an astronomer, that the science will change. Some of the numbers quoted in this handout have changed over the last decade. For example, the age of the Pleiades star cluster was widely believed to be around 65 million years, but new evidence has favored the older 125 million year age quoted above. The 2003 WMAP study announced that the age of the universe is 13.7 ± 0.2 billion years. I personally am not going to be the least bit surprised if someone proves that the age of the universe is outside that ± 0.2" billion year range (for example, if it is only 11 billion years or more than 16 billions years). I also believe that there are "secret things that belong to the Lord" (Deuteronomy 29:29, see also Romans 11:33-36), and that God in His wisdom has not revealed to us the meaning of everything in the Bible ("For now we see in a mirror dimly...now I know in part" 1 Corinthians 13:12). I personally am not expecting a revelation of the full scientific meaning of Genesis 1 & 2 in my life on this earth; I'm expecting to learn at the end of time ("...when the perfect comes, the partial will be done away...then I shall know fully...", 1 Corinthians 13:9-12).

I don't think that these questions about the origin of the universe (and of life) are just remote irrelevant cosmological questions. They profoundly affect our world views, our morals, and the way we live our lives. There is a profound difference between believing that God created the world and people in the world rather than insisting that our origin of our universe is to be traced to an accidental chance combination of blind impersonal physical forces. It as been said that it is doubtful whether the latter purely mechanistic atheistic view of our origins can be a sufficient basis for such human values as goodness, truth, justice and beauty, etc. And it has been argued that in the atheistic view, man is left without ultimate meaning and value, that it is pointless to speak of "human rights", for example, and that in atheism existence is ultimately absurd.

The Judeo-Christian worldview is very different from the atheistic view. In the Judeo-Christian view mankind was created in the image of an infinite personal God. This belief gives people significance, dignity and value. In the Judeo-Christian worldview it is the relatedness to the infinite personal Creator God that gives meaning to the human understanding of what is good, true, just, and beautiful. Existence is not absurd, but is ultimately meaningful.

Acknowledgements: I have drawn heavily on material given in the bibliography. In addition I would like to thank my wife and many other Christians who have contributed directly and indirectly to these notes. Some of the comments on the moral implications I owe to the Rev. Doug Phillips of East Lansing.

A BIBLIOGRAPHY

This is a list of recommended further readings, about the Bible, about Christianity and about the scientific issues raised by Genesis. Some of my price quotes are more than a few years out of date and will be a few dollars too low.

The Bible

If you don't have a Bible, I'd recommend getting either the New American Standard Bible (NASB), or the New King James Version (NKJV). Both are modern translations. If you've never read the Bible before, I'd suggest starting, not with Genesis, but in the New Testament, with one of the Gospels, perhaps John's gospel.

Bible Study Helps

A couple of inexpensive useful books for understanding the Bible are "Unger's Bible Handbook" by Merrill F. Unger (1967, Moody Press) and "Richards' Complete Bible Handbook" by Lawrence O. Richards (1987, Word Books). These books both

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give historical background and archaeological information, useful tables and maps, and so on. If you would like a copy of the Bible with extensive commentary in it I would particularly recommend the Zondervan NASB Study Bible.

Introductory Books About Christianity

"Mere Christianity", C. S. Lewis (1952, MacMillan). Starts with the question "Does God Exist?" If you saw the 1990s movie "Shadowlands" (very loosely based on part of the life of C.S. Lewis), you should read this classic by Lewis to get a more accurate picture of what he was like. C. S. Lewis was the author of The Chronicles of Narnia series (including, The Lion, the Witch, and the Wardrobe.)


"More than a Carpenter" Josh McDowell (Here's Life Publishers). Examines the claims of Jesus Christ.

Books Discussing the Evidence for Christianity

"Evidence that Demands a Verdict" (Vols. 1 and 2) Josh McDowell (1988, Here's Life Publishers). A detailed examination (in note form) of such things as the evidence for the resurrection, the reliability of the Bible and so on. Vol. 2 includes a lot of information about theories we got the book of Genesis.

"Letters from a Skeptic", Gregory A. Boyd and Edward K. Boyd (1994, Victor Books, $11). Subtitled "A son wrestles with his father's questions about Christianity", this book consists of 60 letters exchanged by Dr. Gregory Boyd and his non-believing father (Edward Boyd) over a three-year period in which they "debate" many objections to Christianity, the church, and the Bible.


Genesis

"Genesis: An Introduction and Commentary" Derek Kidner (1967, Tyndale Press/InterVarsity Press) (Vol. 1 in the Tyndale Old Testament Commentaries series, general editor D.J. Wiseman). This is my recommendation for a good inexpensive commentary on the book of Genesis as a whole. A "commentary" on a Bible book is a scholarly book that discusses individual verses, and addresses issues such as the range meanings in the original language (Hebrew in this case), possible variant interpretations, cultural background, and other relevant passages in the Bible. ($10)

"The Origins Solution." Dick Fischer (1996, Fairway Press). Interesting for its discussion of the relationship of Genesis to other middle-eastern ancient histories, and for discussion of the questions of where some of the other events of the first eleven chapters of Genesis fit into history (e.g., Adam and Eve, the flood and the tower of Babel). ($20)

Genesis and Science


"The Christian View of Science and Scripture", Bernard Ramm (1954, Erdmann's). Although over fifty year's old this remains an important detailed book on the subject of science and scripture in general. It gives many possible scientific explanations of things in the Bible. Incidentally, for the astronomy parts, Ramm draws heavily on "The Astronomy of the Bible" by the astronomer Walter Maunder (of sunspot fame - the Maunder were British Pentecostalists).

"The Galileo Connection", Charles E. Hummel, (1986, InterVarsity Press). The first half of the book is about Copernicus, Kepler, Galileo and Newton and their life and faith. The second half is about Genesis 1 & 2, and there is a nice epilogue about a Christian mathematician, Blaise Pascal.

"Creation and Time", Hugh N. Ross (1994, NavPress). Perhaps the best book available on the question of the timescale of

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Genesis 1. Includes some material about the implications of modern astronomical observations that can also be found in Ross's other books (see below). ($11)


Cosmology

"The Fingerprint of God", Hugh N. Ross (1991, Promise Publishing Co.: Orange, California, about $10). Discusses the important implications of modern cosmology (at approximately the level of a university introductory course) for Christian faith. Includes discussion of the history of philosophy and a very brief (note form) discussion of the problem of suffering and evil and an excellent discussion of Genesis 1 and 2. Lots of references to the literature. Ross is an astrophysicist. He is weak on biology and geology.

"The Creator and the Cosmos", Hugh N. Ross (1993, NavPress, about $10). This has quite a bit of material in common with his earlier book, and is at the same level, but is more up to date. If you're really interested in the theological implications of modern astronomical discoveries, Hugh Ross's books are a good place to turn. Many Christian astronomers have praised Ross's books.

Dr. Ross has a very useful web site (http://www.reasons.org/).

Biographies

"Scientists of Faith", Dan Graves (1996; Kregel Resources). This book consists of 48 biographies of historic scientists and their Christian faith. It's a wonderful little book. It consists of short, concise, well-written, scientific and spiritual biographies and a little additional historical commentary. Each biography is kept to about three pages. The book is great for browsing and casual reading in addition to being a useful reference. Something I particularly admire about Graves's book is that it presents the faults of the scientists as well as their strengths, because, as the author puts it "that is how the Bible depicts the saints" ($10)

History of the "Young Earth" movement

"The Creationists", Ronald L. Numbers (1992, University of California Press). This is a very detailed history (about 450 pages) of young-earth creationists. Lots of details, and references to original sources. The Seventh-Day Adventist connection is well documented. ($16, paperback edition)

The Origin of Life and Evolution

I don't have the inclination or space here to go into the biology issues. My first advice to someone interested in the Bible and biology issues is to talk to a Christian biologist or to a Christian geologist for geology issues. To sample the range of opinions Christian biologists and geologists have on the various issues I recommend looking at back issues of the journal of the American Scientific Affiliation (Perspectives on Science and Christian Faith) or some of the articles they have available on-line (see their website below).

Scientific Evidence and Philosophical Arguments for a Creator

"The Creation Hypothesis: Scientific Evidence for an Intelligent Designer", edited by J. P. Moreland (1994, InterVarsity Press; $13). In this book J. P. Moreland and a panel of scholars assert that there is considerable evidence for an intelligent creator of the universe. They consider philosophical arguments about whether it is possible to know if an intelligent designer had a hand in creation and then look at evidence from different areas of science. The team of experts consists of a philosopher, a mathematician, a physicist, a linguist, a theologian, a biophysicist, an astrophysicist, a chemist and a palentologist. Not lightweight reading.


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There have been some research-level conferences on the origins issue over the last decade. You can find information on a 1996 conference at Biola University in the book “Mere Creation: Science, Faith & Intelligent Design” ed. William A. Dembski, (InterVarsity Press 1998), 448 pp., $24.99. Information about this conference can also be found on-line at http://www.origins.org/ and you can find the proceedings of a 1997 conference at the University of Texas on science and them at http://www.dla.utexas.edu/depts/philosophy/faculty/koons/ntse/papers.html.

Easier Reading

“Teaching Science in a Climate of Controversy” ($7?) - a 48 page illustrated booklet put out by the Committee for Integrity in Science Education of the American Scientific Affiliation (P.O. Box 668, Ipswich, MA 01938-9980). This is designed for school teachers. An excellent discussion of the science issues and the limits of what is known. References to many more books and articles on the issue of creation and evolution at the back of the booklet. Recommended if you are in or are going into any kind of school teaching.

‘Defeating Darwinism by Opening Minds”, Phillip E. Johnson (1997; InterVarsity Press, $10). As I’ve said above, I believe the evidence for common descent of species is very strong and I have no personal theological trouble with the theory of evolution, but I do want to recommend one book by a man noted for his criticism of evolution, Phillip Johnson of the University of California, Berkeley. This straightforward book is aimed at high-school juniors and seniors and beginning college undergraduates, along with their teachers and parents. Johnson believes that the key to defeating the exaggerated claims of any theory is to open people’s minds to good thinking habits. I particularly recommend the chapter “Turning up Your Baloney Detector.”.

SOME ORGANIZATIONS

The American Scientific Affiliation ("ASA") (http://www.asc.monterey.edu/ceo/ASA/ASA2.html) – a fellowship of men and women of science and disciplines that can relate to science who share a common fidelity to the Word of God and a commitment to integrity in the practice of science. The ASA was founded in 1941 and has grown significantly since that time. The stated purpose of the ASA is “to investigate any area relating Christian faith and science” and “to make known the results of such investigations for comment and criticism by the Christian community and by the scientific community.” As already discussed, I particularly recommend the ASA Journal as a source of book reviews. You will find good discussions of the strengths and weaknesses of some of the books recommended here in their journal and on their home page (see above). The ASA can be contacted at P.O. Box 668 Ipswich, MA 01938 or (508) 356-5656 or asa@newl.com

In addition to the American Scientific Affiliation, other organizations you might be interested in include:


The Affiliation of Christian Geologists http://www.wheaton.edu/agg

Chr-astro (Christian professional astronomers) http://www.calvin.edu/~dhuursma/chr-astro/resources.html

Includes a list of articles written by Chr-astro members, and many resources.

Association of Christians in the Mathematical Sciences http://www.calvin.edu/~stob/acms/home.html

Affiliation of Christian Engineers http://enr.calvin.edu/ces/index.html

The Society of Christian Philosophers http://www.siu.edu/departments/cola/philos/SCP/

Leadership U – a very useful web site for finding scholarly articles on Christianity and a wide range of subject areas, including the humanities and social sciences as well as science. Many thousands of articles available on-line. http://www.leaderu.com/

Reasons to Believe – also has interesting information. http://www.reasons.org/


RETURN TO MARTIN GASKELL’S PERSONAL WEB PAGES

http://incolor.inetnebr.com/gaskell/genesis.html

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To the Committee,

Mike Kovash spoke with two of the three candidates who interviewed last week. I copy his comments below for your consideration. Please keep this communication confidential.

Tom

> Date: Mon, 15 Oct 2007 10:31:00 -0400
> From: "Michael A. Kovash" <dus@pa.uky.edu>
> To: Tom Troland <troland@pa.uky.edu>, "Michael A. Kovash" <dus@pa.uky.edu>,
> Mike Cavagnero <mike@pa.uky.edu>
> Subject: Observations on the Director
> 
> CONFIDENTIAL
> 
> Tom:
> 
> Mike asked me to meet with the candidates for the directorship of the
> observatory. I was able to have productive talks with both Martin
> Gaskell and Tim Knauer. Due to Monday's tight schedule I did not have a
> chance to meet our first candidate.
> 
> I don't pretend to know or to understand the full range of duties that
> are envisioned for the director, but I talked with these men to gauge
> their ability to maximize the educational content of the facility for our students.
> I looked to see what ideas they had for small-scale projects that
> non-majors might do, and I talked with each about using the telescope
> as a resource for research projects for our undergraduate majors. I
> also was interested in how well each was able to communicate with a non-expert like myself.
> 
> On all of these counts, I felt that Martin had a significant edge over Tim.
> He has a demonstrated ability to provide low-level projects for
> non-majors which are both pedagogically relevant, readily accomplished,
> and interesting. He listed a number of examples of these projects for
> me, and all seemed to be soundly conceived. Martin also has engaged
> undergrad astronomy majors in ongoing measurements of the variability
> of quasars. The process of calibrating the instruments to collect and
> analyze these data is non-trivial, and looks like an idea undergraduate
> project. Significantly, he has 8 current students doing this work, and
> external funding to support them.
> 
> While Tim starts this discussion with a clear disadvantage, I looked to
> see what ideas and what initiative he might bring to future work in this area.
> Although he had been thinking about projects that introductory students
> might accomplish, Tim was mostly at a loss for ideas about projects for
> our majors. While I don't want to say that he would not be able to do
> this in the future -- given enough time and resources -- I do worry
> that he would not have the drive necessary to actually pull it off. In
> my opinion, while he worked in our lecture/demo area Tim did not
> display much initiative, and I would expect that the multi-faceted
> responsibilities of the observatory directorship would be allowed to
> consume all of his time in other ways. Finally, I frequently found
> Tim's discussions with me to be confusing, and I often had to bring him
back to explain a particular point that I had missed.
To the committee:

The Observatory Committee meet today for an hour and a half to discuss the observatory director applicants. No census developed regarding a leading candidate, and no hiring recommendation came out of this meeting. So we will need to meet again. Please review the possible meeting days and times listed at the end of this message and indicate which times you are available.

For the benefit of those in attendance (and those who were not), I summarize some aspects of our discussion below:

(1) All three interviewed applicants likely could do the job - The committee believes that each of the three we interviewed has important strengths and has reasonable prospects for being successful at the position. Gaskell, clearly, has the most experience. But Sykes and Knauer gave indications that they could grow into the job and gain the needed expertise to fulfill the wide ranging job duties.

(2) All three interviewed applicants have weaknesses - Gaskell does not seem to be especially interested in developing ties with (and programs for) K12 teachers. Also, as a very senior individual (and by apparent personality type) he may be reluctant to take directions from the department on observatory management and priorities. He is not viewed as an especially good listener. Sykes is viewed, perhaps, as less driven than the others and more reticent. He might need more supervision and more prodding to accomplish all desired observatory director responsibilities. Knauer is filled with enthusiasm and has many ideas. However, he has no experience managing an observatory, and he may not be inclined to take leadership in developing all aspects of the observatory. He may need more direction, such as a faculty supplied "to do" list.

(3) If we offer the job to any applicant, we should plan in advance to deal with the applicant's weaknesses - Who in the department, for example, would work with Gaskell to implement K12 teacher initiatives? Who would see that Sykes stays on task and fulfills all responsibilities? Who would create Knauer's "to do" list?

(4) Should we re-advertise the job? - Since none of the applicants we interviewed (nor any that we did not) appears to meet all of our criteria, should we re-advertise the job? The committee noted that the UK Human Resources website (and our job description) may have dissuaded some applicants, especially Ph.D. level applicants, from applying. If we did re-advertise the job, we might (or might not) get a better pool of applicants. However, we would also very likely lose the existing applicants to other positions, and we would delay hiring an observatory director for many months.

Obviously, we need to meet again to consider all of these issues, especially items (3) and (4). Please let me know which time slots listed below are available for you NEXT WEEK. And please think about the issues discussed above in advance of our next meeting.

Tom

POSSIBLE MEETING DAYS AND TIMES (week of October 22):

'y' means available, "?" means available with some difficulty

Monday 3:00p
Monday 4:00p
Monday 5:00p

Tuesday 12:00n
Tuesday 1:00p
Bender, Patty

From: Mike Cavagnero [mike@pa.uky.edu]

Sent: Wednesday, October 17, 2007 10:44 AM

To: Gary J. Ferland; Macadam, Keith; Nancy Levenson; Tom Troland; Shafer, Sally Anne; Steve Ellis

Subject: the biologists weigh in

Committee members:

In fulfilling the charge laid upon us by the Dean and Provost, I asked two Colleagues in the Department of Biology to assess the scientific credibility of Martin Gaskell's website.

Please understand that they did so only at my bidding, and that they had no desire to meddle in our departmental affairs. Also understand that there is no venue at UK in which scientists are forced to struggle more frequently and tirelessly with public perceptions of conflicts between science and faith, then in our Department of Biology. We in P&A have long been (most happily) on the periphery of this conflict. I think that you can see from their comments, attached below, that they seem nearly exhausted from the effort.

I am deeply indebted to these individuals for their voluntary service to our Department.

Mike Cavagnero

The first comment is from Jeff Osbourne:

Mike:

I've done a considerable amount of searching, reading and inquiry in response to the scientific validity of the various aspects of Martin Gaskell and his website(s). This one is a very sticky wicket, indeed but I hope that I can assist you in your process. On the one hand, it seems that Gaskell is very stealthy and clever in his approach to the issues of creationism and his clear and obvious connections to deep seeded religious beliefs. While I have no particular issue with one's views on religion, I strongly believe that when it comes to the concepts of religion and science, they should remain on different levels of a college of arts and sciences. Gaskell clearly has no intention of doing such and I would firmly assert to you that in any position of outreach this will most certainly bring both internal and external problems to the department, the college and the university. In short, his public premise is to provide as much intertwining between science and religion as possible and this will most certainly lead to public misconceptions of scientific_evidence_. The nature of science is based entirely upon empirical evidence for understanding natural phenomena. In science education, we work tirelessly to help students and the public understand that scientific thought must be based upon evidence which leads us to solid conclusions. Virtually everything presented in his published website works to discredit the very nature of science upon which we are trying educate all students and the public. In a position where outreach to K-12 students and the public is a major component of the job description, it seems to me that open dialogue pulling the nature of science away from an empirical evidence based discipline will be highly counter-productive. In this regard, it will be difficult to justify or support the building of an "outreach science" team within the college with these types of individuals that choose to ignore empirical evidence in their understanding of the nature of science.

There are statements within the website that are simply incorrect and without scientific basis:

1. "It is true that there are significant scientific problems in evolutionary theory (a good thing or else many biologists and geologists would be out of a job) and that these problems are bigger than is usually made out in introductory geology/biology courses, but the real problem with humanistic evolution is in the unwarranted atheistic assumptions and extrapolations. In actuality, the empirical and embedded evidence for genetic change and the concept of evolution has become overwhelming within the past 50 years. The rate at which we are learning about and understanding the world of genetics is mind boggling to say the least but certainly not without solid and sound scientific evidence. In general, Gaskell avoids the issue of evolution within this website and his online interpretations. It seems to me that this is likely out of his league and someone like Jim Krupa in biology would pretty much discredit anything that he has to say about the concept of evolution. As a faculty colleague, you can pretty much assume that most in bioscience would not take him seriously and some (like Jim and myself) would find ourselves constantly defending the empirical evidence side of science with students and the public. In science, we teach the concepts and theories of gravitational forces beginning in grade 7/8 (per the KDE state science standards) and although these concepts remain theoretical in nature, none of us question the existence of "the force". There is significant and unequivocal evidence for the concepts of natural selection and evolution and they are taught from the clear perspective of scientific evidence throughout all of biology. I am currently reviewing for adoption a new introductory biology textbook and I can tell you that the concepts of genetic change and evolution and intertwined within
every aspect of the textbook. In addition, the evidence for the existence of genetic change is very clearly presented. I can assure you that my review will note this aspect of the text as one of the most positive pieces for the teaching of undergraduate biology. Thus, the statement from the website highlighted above could not be further from correct.

2. “While discussing controversies and interpretations of Genesis I should mention something that is not an interpretation of Genesis: what is called “Intelligent Design”. This movement, which is often erroneously confused with young-earth creationism, is simply exploring the question of what evidence there is in the universe for design by an intelligence. This is a general, non-religious question (although with obvious religious implications), and there is no opinion on the interpretation of Genesis.” Both Jim Krupa and I could not disagree more with this web statement of Dr. Geskell. ID is most certainly NOT a “general, non-religious question”. It is presented in it’s entirety from a religious point of view, which neither of us have a quibble with. However, to present ID within the context of empirical evidence based science is incorrect and unfounded. This type of misinterpretation of science is carefully couched within many aspects of the website. The publication is largely a dialogue of religion with significant numbers of quotes by famous scientific figures. I doubt that any of us would challenge the freedom of intellectual thought of any major scientific figure........including Dr. Geskell........that is the very nature by which great scientific discovery is made. All of us........including those quoted in the website........would not consider any scientific discovery valid in the absence of empirical evidence. The website continually mets concepts of religious belief within the context of scientific thought. These types of implications simply lead the public and students into becoming confused about fundamental concepts of the nature of science and the beliefs of religion.

In short, I find the very nature of the position for which you are seeking a viable public outreach servant to be at complete odds with the published views and nature of scientific study by Martin Geskell. The very nature of how we present science to young people, developing scientists and the public would be greatly compromised by the presentation of these issues by Geskell. We are struggling in the country to teach and train young minds to function and understand science based upon evidence and an understanding of how to conduct a valid scientific investigation. Certainly, we do not need to muddle this picture from the vantage point of our perception of “outreach to the public”.

Mike, if you have any other questions in regard to these views or issues, please do not hesitate to contact me.

Best regards,
Jeff
Jeffrey L. Osborn, Ph.D.
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The second comment is from Jim Krupa:

Greetings Mike,

I do hope the committee will consider the email Jeff sent seriously. To have an anti-evolution scientist come to UK and be involved with science outreach will be a disaster despite the person’s area of science. I’ve heard Gaskell bash evolution (evolution is the unification theory of all biology). He will seriously harm science education. We might as well have folks from the creation museum get involved with UK’s science outreach efforts.

I know that if Biology had the opportunity to hire the greatest geneticist that exists and one with multiple Nobel Prizes, who also was going around lecturing on the age of earth being 6000 years, I would fight to prevent the hire. With all the problems we have in improving science education, Gaskell will only set us back. And he WILL bash evolution! He did when he spoke here many years ago in Memorial Hall. I really ripped into him during question-answer period, and his responses only got more ridiculous and more creationist in nature. I found him to be a complete embarrassment to my alma mater (the University of Nebraska) after hearing his talk.

Gaskell concerns me deeply!

Cheers, Jim

Finally, I’ll add my thanks to these two faculty members to their Chairman, Shelly Steiner, who responded as follows:
Mike,

Biology would not hire an individual who supports the thesis that the sun revolves around the earth. No matter how good a biologist he/she was.

Regarding the public ignorance about evolution which we combat in biology everyday:

"Look at the declining role of science and reason in our society and wonder how we could be anywhere but this sorry juncture. A 2001 Gallup poll found that 45 percent of Americans believe evolution is flat-out wrong; the Washington Times reports that more than 60 percent of Americans believe that the Biblical Genesis and Noah’s Ark stories are literally true. True believers are pulling their children out of public school by the thousands to avoid contaminating them with unwanted questions. All of those children are being bred to believe what they are told, and that the world view of their parents and teachers is correct - simply because they say so." From RELIGIOUS MIGHT The Church of Bush By John Steinberg | RAW STORY COLUMNIST

In addition roughly 20% of the population believes that the sun revolves around the earth- 17% believe that the sun revolves around the earth once a day.

Dr. Miller’s data reveal some yawning gaps in basic knowledge. American adults in general do not understand what molecules are (other than that they are really small). Fewer than a third can identify DNA as a key to heredity. Only about 10 percent know what radiation is. One adult American in five thinks the Sun revolves around the Earth, an idea science had abandoned by the 17th century. By CORNELIA DEAN
Published: August 30, 2005- NY Times Science

Mike thanks for the cc: I had experience in the UK senate in which colleagues from the school of engineering challenged evolution as a science.

Shelly
Gary,  

Thanks for the reply! I gather that you would be willing to serve on the committee if the exam is scheduled on one of those four days. (Of course, you are on sabbatical, so you are not obligated!)  

If you are willing to serve, do you have any preferences among those four days?  

And thanks for your thoughts about Crystal. I'll pass this suggestion along to Susan who will contact Crystal. As far as the M17 matter is concerned, the argument for putting the 20 km/s HI absorption component in the M17 5W molecular gas is strictly kinematical. That particular HI component matches the velocity of CO and other molecular emission lines almost exactly. Of course, there are other HI components in M17, notably the ones labelled "11-17 km/s"; these, presumably, are outside the M17SW molecular cloud, truly in the PDR. It is conceivable that the 20 km/s HI component originates from trace atomic hydrogen in the largely molecular gas of M17SW. Or it is possible that the molecular cloud is clumpy enough to admit dissociating radiation, so you have small PDR regions embedded within the largely molecular gas of M17SW.  

As is always the case in astronomy, it is impossible to know for sure.  

It does truly look as if Gaskell has been blackballed by the biologists. Mike C. implies that the Dean would never go for the hire, it would create too much friction with biology. Too bad in many ways. Gaskell is head and shoulders above any of the other applicants in experience, and he is, as you know, a well respected research scientist with lots of publications, citations and successful grant proposals. His CV would put to shame many members of our faculty. However, this all makes very little difference to me. I am becoming more philosophical in my old age!  

Tom  

At 12:25 PM 10/18/2007, you wrote:  
> > "I seem to recall that you plan to come back to the U.S. in January.  
> > (Or maybe I am making this up!) If I am not making this up, then  
> > could you  
> > give me an idea of when you plan to be in Lexington? Not  
> > only, of course,  
> > would it be fun to see you and go out for a brewski, but you are  
> > also on Elizabeth Mayo's Ph.D. committee. So if you were in town  
> > and willing to be present for her Ph.D. defence, that would be  
> > great. Please let me know your thoughts on this matter."  
> >Hi Tom,  
> >I am in Lexington 3 & 4 January, and 9 & 10.  
> >  
> > (2) Susan Gardner is pressing me to find a colloquium speaker for  
> > March 28, 2008. Among the speakers at the conference, I think
Crystal might be a good choice. With Crystal, we could highlight (a) a UK graduate, (b) a woman, and (c) ALMA, a possible direction for future hires in the department.

She would be excellent. She does seem stuck on the idea that if you look at an H+ region through a PDR, that 21 cm will form in the H2 region not in the H0 region. I need to understand her problem with making HI absorption in H0 gas. It makes little sense to me that HI would form in H2 gas when there is a load of H0 in the way. I suppose we will duke it out at your meeting.

Gary