

CRSQ

CREATION RESEARCH SOCIETY QUARTERLY



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Haec Credimus

For in six days the Lord made heaven and earth, the sea, and all that in them is, and rested on the seventh.—Exodus 20:11

Quarterly Dedication to Glen and Becky Wolfrom

The Wolfroms have faithfully served the Creation Research Society since 1983 when Glen joined the Society's Board of Directors. In two years Glen became the Membership Secretary, only the second in the Society's 38-year history. He initiated the *Creation Matters* publication in 1996, first serving as Managing Editor and since 1997 as General Editor. In 1994 he organized CRSnet which is the CRS Internet Discussion Group, and he has been its Moderator since the beginning. Also in 1994 Glen established a CRS Internet website, the first for any of the major creationist organizations.

Not only does Glen handle all aspects of the CRS membership, but also he receives and processes book orders. In 1991 he produced the first *CRS Resource Catalog*, publishing it each year until 2000 when his daughter, Cindy, took over. His membership reports at annual Board meetings are intricately illustrated with charts and graphs and brilliantly presented. Other Board members respect him for his knowledge and wisdom in dealing with a multitude of issues involving the CRS. In all of his interactions with others, he personifies a man of gracious and humble Christian character. Dr. Wolfrom was elevated to the status of CRS Fellow in 1994.

Dr. Glen Wolfrom has experienced an illustrious academic career, enjoying an Illinois State scholarship during 1965-1969. For 1967 and 1968 he was presented the American Society of Animal Science Scholarship Awards. In 1969 he received a B.S. with honors for a major in animal science (zoology minor) from Western Illinois University. He was awarded fellowships, graduate research and teaching assistantships from Southern Illinois University (M.S. in Animal Industries, 1972) and University of Missouri (Ph.D. in animal husbandry with statistics minor, 1976).

Glen has been employed in industry since 1976 and currently is project leader and Senior Clinical Research Scientist for Boehringer Ingelheim Vetmedica, Inc. He holds three patents, has authored or coauthored seven technical papers and 20 technical presentations at professional meetings. In addition to the above, he has authored or coauthored for *CRSQ* or *Creation Matters* seven major papers and 22 short articles.



He was married in 1969. He and wife, Becky, have two daughters, Cindy and Katie, and three grandchildren. Becky Wolfrom has worked with her husband Glen and the CRS since the late 1980's. She has performed CRS secretarial duties, principally involving memberships, subscriptions, and book sales; and she has played a very valuable role as proofreader for *Creation Matters*. Regularly, Becky has traveled with Glen to the annual Board meetings where she has enthusiastically assisted in caring for the myriad of details for a smooth running of the various activities associated with the three-day program. The Wolfroms' daughter, Cindy Blandon, as a graphic designer, has aided the CRS by preparing advertisements, and designing books and CRS resource catalogs. Daughter Katie Brown assisted in keyword entry for the eight-year cumulative index edited by Glen in 1992.

It is an honor and privilege to be afforded an opportunity to write this dedication for an outstanding man and his family. We pray for God's richest blessings on the Wolfroms and their continuing service with the worldwide outreach of the Creation Research Society.

Wayne Frair

Book Review

Creation, Evolution, and Modern Science: Probing the Headlines that Impact your Family by Ray Bohlin
Kregel Publications, Grand Rapids. 2000, 192 pages, \$12

Authors of this book (CEMS) maintain a strong stand against naturalism and evolution. Yet in the same context

they express acceptance of some differing views within a biblical Christian framework. The scientific data are eval-

uated from within “the standard evolutionary time frame” (p. 9), but respect also is expressed for a biblical “young earth approach” (p.183). The writers believe that we are in the process of building a more solid foundation for understanding creation. *CEMS* lacks an index but has good endnotes including references for each of the 15 chapters.

Ray Bohlin, Ph.D., who wrote more than two-thirds of *CEMS*, has four earned degrees in biology. The three minor contributors (Sue Bohlin, Ray’s wife; Rich Milne; and Richard Wade) have stronger formal backgrounds in theology. Ray Bohlin has had many years of exposure to creation/evolution issues, and he is author of an earlier book (Lester and Bohlin, 1989) and various papers on this subject. His organizational capabilities clearly are exhibited, for example in Chapter one of *CEMS* where he deals with “The Five Crises in Evolutionary Theory” (p.12). These are critical fields “where Darwinism and evolutionary theory in general are failing. They are

1. the insubstantial basis for the Darwinian mechanism of evolution,
2. the total failure of origin-of-life studies to produce a workable model,
3. the inability of evolutionary mechanisms to explain the origin of complex adaptations,
4. the bankruptcy of the blind-watchmaker hypothesis, and
5. the biological evidence that the rule in nature is morphological stability over time, not constant change.”

One of the sections in the “Are We Alone in the Universe?” chapter deals with “Chemical Evolution on Earth.” The difficulties of producing life from non-living materials “fall into three categories: the chemical problem, the thermodynamic problem, and the informational problem” (p. 87).

Several chapters of *CEMS* each are employed for evaluation of a book or film by a particular author. These include: Chapter 5, Richard Dawkins, *A River out of Eden*; Chapter 6, Carl Sagan, *Contact*; Chapter 8, Phillip Johnson, *Defeating Darwinism by Opening Minds*; Chapter 9, Michael Behe, *Darwin’s Black Box*; Chapter 13, John Sailhamer, *Genesis Unbound*.

In Chapter 5 Bohlin says that Dawkins is “trying to travel up his river of DNA in a canoe without a paddle. It just won’t work” (p. 66). In Chapter 6 Bohlin points out how Carl Sagan said that if the universe were created for us, then its being so big constitutes a waste of space. Bohlin’s reply is that “...if the main purpose of the universe is to glorify the splendid, eternal, all-powerful God, it could never be big enough” (p.77).

The sociobiology chapter I found to be particularly pertinent in revealing the dangerous philosophical threat of an evolutionary worldview. The chapter entitled “How

to Talk to Your Kids” is in dialog form between Ray Bohlin and his wife, Sue, who asks pertinent current common questions which then are answered by author Ray.

As shown above, the *CEMS* covers a broad spectrum of topics and Bohlin demonstrates a respectable grasp of the various subjects. However, because scientific views change so rapidly, it is no small task for any single author to remain current. For instance, the anthropology chapter could have been strengthened by inclusion of more recent material including Hartwig-Scherer (1998) and Cuozzo (1998).

Recently a critical and strongly negative review of *CEMS* was written by Glenn R. Morton (2001). A major objection of Morton pertained to Bohlin’s coverage of the Cambrian “explosion.” This was a period of time during which a variety of animal forms abruptly appeared with no obvious precambrian transitional intermediates. Bohlin (2001) replies with appropriate reference material supporting his contentions.

Ray Bohlin is looking forward to an upsurge of interest in the important ancient concept of Intelligent Design (ID). The evidence for ID ranges from the programming of DNA through developmental mechanisms and beyond. A section dealing with this topic concludes with a particularly pertinent paragraph:

It is difficult for me to imagine that honest men and women could study the immense complexities of even the “simplest” creatures and not marvel, or better yet worship, at the feet of their Creator (p. 46).

Bohlin’s book contains a wealth of information to challenge the thinking of all those interested in origins.

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The Earth's Magnetic Field is Still Losing Energy

D. Russell Humphreys*

Abstract

This paper closes a loophole in the case for a young earth based on the loss of energy from various parts of the earth's magnetic field. Using ambiguous 1967 data, evolutionists had claimed that energy gains in minor ("non-dipole") parts compensate for the energy loss from the main ("dipole") part. However, nobody seems to have checked that claim with newer, more accurate data. Using data from the International Geomagnetic Reference Field (IGRF) I show that from 1970 to 2000, the dipole part of the field steadily lost 235 ± 5 billion mega-

joules of energy, while the non-dipole part gained only 129 ± 8 billion megajoules. Over that 30-year period, the net loss of energy from all observable parts of the field was $1.41 \pm 0.16 \%$. At that rate, the field would lose half its energy every 1465 ± 166 years. Combined with my 1990 theory explaining reversals of polarity during the Genesis Flood and intensity fluctuations after that, these new data support the creationist model: the field has rapidly and continuously lost energy ever since God created it about 6,000 years ago.

Introduction

Seven centuries ago, a French military engineer, Pierre de Maricourt, carved a sphere out of lodestone, which contains strongly magnetized iron oxide. Using iron needles, he traced the magnetic lines of force around the sphere. He noticed that the lines of force converged upon two points diametrically opposite each other on the sphere. In a widely circulated letter under the name Petrus Peregrinus (1269), he called these points the magnetic *poles*.

Figure 1a shows the magnetic lines of force outside a magnetized sphere. The lines of force outside the sphere have a mathematically precise shape called a *dipole* field. Having two poles, one north and one south, it has the same shape as the field from a tiny but powerful bar magnet right at the center of the sphere. Another kind of source for a dipole field would be a doughnut-shaped flow of electric current within the sphere, as Figure 1b shows.

Three centuries later, William Gilbert (1600), Queen Elizabeth's personal physician, carefully compared observations of the earth's magnetic field with the field of a lodestone sphere. He found them very similar. The field of the earth is indeed close to being that of a dipole, though the dipole's axis tilts about 11.5° away from the earth's rotational axis. However, the actual field in some places can

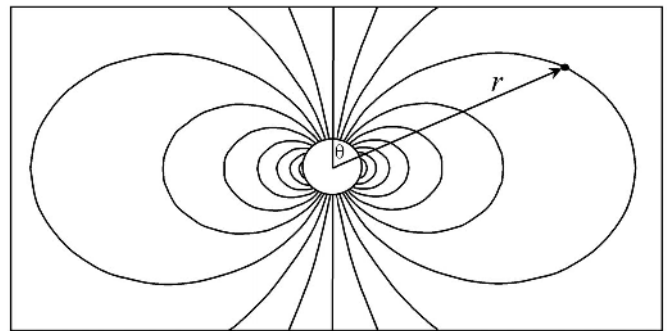


Figure 1a. Dipole field around a magnetized sphere. For a purely dipolar field, the equation $r^3 = R^3 \sin^2 \theta$ relates the radius r and colatitude θ of each point on a given line of force, R being the value of r where the line of force intersects the equatorial plane.

deviate from that of a purely dipole field by as much as 10% in direction and intensity.

Early in the nineteenth century, Carl Friedrich Gauss (1833; 1839) used many measurements from all over the world to characterize the earth's field. Using what is now called "spherical harmonic analysis," he mathematically divided the field into dipole and *non-dipole* parts.

The non-dipole parts of the earth's field have more than two poles. For example, the *quadrupole* part has a four-pole shape, such as a square of four bar magnets would produce (Figure 2b). A cube of bar magnets, having eight corners and eight poles, would produce an *octopole* field (Figure 2c), and so forth in multiples of two. One name for each part of the field is *harmonic*. Another is "mode."

Of course, the actual cause of the earth's non-dipole field is not bar magnets, but simply small irregularities in the electric current in the earth's core. For example, sup-

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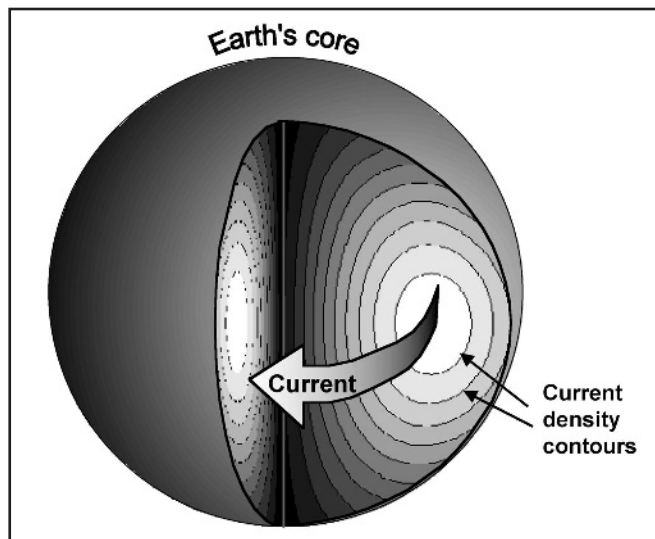


Figure 1b. Westward electric current in the earth's core which would generate a purely dipolar magnetic field. The oval lines are contours of constant current density (amperes per square meter). Current is high in the bright regions, low in the dark regions. Contours calculated from Barnes' solution for current density (Barnes, 1973, p. 228, eq. 57).

pose the doughnut-shaped flow of current I mentioned above were not lined up exactly with the earth's center, but offset a bit northward above the center. Then the resulting field would have most of the non-dipole parts we observe in the earth's field (Benton and Alldredge, 1987).

The strength of the source of each part of the field is called its *moment*, such as the "dipole moment" and the "quadrupole moment." Gauss found that the earth's magnetic dipole moment is an order of magnitude stronger than any of the non-dipole moments.

Scientists after Gauss continued to make global measurements of the field. Three decades ago, Keith McDon-

ald and Robert Gunst (1967; 1968) published the first systematic analysis of such measurements, covering the whole period from 1835 to 1965. They drew a startling conclusion: during those 130 years, the earth's magnetic dipole moment had steadily decreased by over eight percent! Such a fast change is astonishing for something as big as a planetary magnetic field. Nevertheless, the rapid decline remained relatively unknown to the public, a "trade secret" known mainly to researchers and students of geomagnetism.

2. The Geomagnetic Wars

A few years later, Thomas Barnes (1971), a creationist physicist, began publicizing the trade secret. He showed how the decay of the dipole moment is consistent with simple electromagnetic theory. A six billion ampere electric current circulating in the earth's core would produce the field. By natural processes, the current would settle into the particular doughnut-shaped distribution necessary to produce a dipole field. The electrical resistance of the core would steadily diminish the current, thus diminishing the field (Barnes, 1973). Dr. Barnes's equations, combined with the observed decay rate, gave a value of core resistance consistent with laboratory-derived estimates (Stacey, 1967). The decay rate is so fast that if extrapolated smoothly more than a dozen or so millennia into the past, the earth's magnetic field then would have been unreasonably strong. These points taken together make a good case for the youth of the field, and consequently for a young earth.

After a decade of watching public attention to Barnes's case grow, the evolutionists finally responded in a science journal. Brent Dalrymple (1983a,b), a geologist, criticized Barnes's assumptions, which were that we can neglect (1) motions in the core fluid and (2) the non-dipole parts of the field. Dalrymple claimed that motions of the core fluid today, though slow, are enough to cause a magnetic polarity reversal just like the many magnetic reversals recorded in geologic strata. Then the present decrease of the field would be a magnetic reversal in progress, taking thousands of years to complete its course. Citing McDonald and Gunst, Dalrymple (1983b, p. 3036) then made a claim which is the main issue of this paper:

The same observatory measurements that show the dipole moment has decreased since 1829 also show that this decrease has

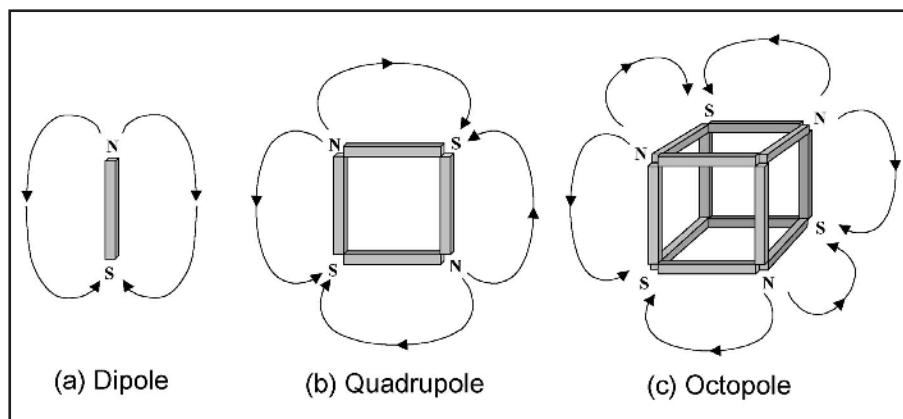


Figure 2. Dipole and non-dipole magnetic fields from bar magnets: (a) dipole, (b) quadrupole, and (c) octopole. Each source can have various orientations relative to the coordinate axes. The actual sources of the fields in the earth's core are various distributions of electric current.

been almost completely balanced by a corresponding increase in the strength of the nondipole field, so that the strength of the total observed field has remained about constant.

Dalrymple's words "dipole moment" and "strength" above are ambiguous. Since moments from different harmonics have different physical units, it is not clear how one could exchange them. If one ampere-meter² of dipole moment somehow goes into the next harmonic, by how many ampere-meters³ should the quadrupole moment increase? In view of the subject of his surrounding paragraph, "energy," he probably meant to say:

The decrease of *energy* in the dipole part has been almost completely balanced by a corresponding increase in the *energy* of the nondipole field, so that the *energy* of the total observed field has remained about constant.

In the context of Dalrymple's emphasis on past polarity reversals and intensity fluctuations in the field, he seemed to be placing his hopes on a conjecture: that energy from the dipole part of the field is not being dissipated as heat, but is instead being stored up in the non-dipole part. Later it would be converted into a new dipole field with reversed polarity.

Dalrymple also claimed that some energy from the dipole part was going into an unobservable "toroidal" part of the field, in which the lines of force wind through the earth's core in the east-west direction. Because such lines of force would remain within the core, they would only reveal their presence indirectly, by currents traveling outside the core in the earth's mantle and crust. Shortly after Dalrymple made that claim, several Bell Laboratories scientists found that such currents are very small (Lanzerotti *et al.*, 1985). Barring very improbable structure (alternating layers of conductors and insulators) in the earth's mantle, their result implies that the toroidal part of the earth's magnetic field is small, removing such fields as a significant reservoir for energy disappearing from the dipole part.

Barnes (1984) replied to Dalrymple by asserting that the non-dipole components are merely irrelevant "noise." He did not calculate non-dipole energies. As for past magnetic polarity reversals, he cast doubt on their reality, citing a number of papers.

After surveying the evidence for geomagnetic polarity reversals for myself, I concluded that they had indeed occurred. I proposed that they took place rapidly during the Genesis Flood (Humphreys, 1986). I outlined a "dynamic decay" theory generalizing Barnes's free-decay model to the case of motions in the core fluid. I suggested that if such motions were fast enough, they could cause magnetic polarity reversals. Also, I predicted the paleomagnetic signature rapid reversals would leave in thin, rapidly-cooling lava flows.

Dalrymple had an opportunity to be an official reviewer for my paper, and to have his review published. He did not take advantage of the opportunity. In my response to the other reviews of my paper, I made note of Dalrymple's silence (Humphreys, 1986, p. 126).

Shortly after that I published a review of the evidence for past polarity reversals, reaffirming their reality (Humphreys, 1988). Then I developed my dynamic-decay theory further, showing that rapid (meters per second) motions of the core fluid would indeed cause rapid reversals of the field's polarity (Humphreys, 1990). I cited newly discovered evidence for rapid reversals (Coe and Prévot, 1989), evidence in thin lava flows confirming my 1986 prediction. Since then, even more such evidence has become known (Coe, Prévot, and Camps, 1995).

The reversal mechanism of my theory would *dissipate* magnetic energy, not sustain it or add to it, so each reversal cycle would have a lower peak than the previous one. In the same paper (Humphreys, 1990, p. 137), I discussed the non-dipole part of the field today, pointing out that the slow (millimeter per second) motions of the fluid today could increase the intensity of some of the non-dipole parts of the field. However, I concluded by saying the total energy of the field would still decrease.

Despite these creationist answers, skeptics today still use Dalrymple's old arguments to dismiss geomagnetic evidence. Much of that is probably due to ignorance of our responses, but some skeptics are still relying on the non-dipole part of the field. They hope that an energy gain in the non-dipole part will compensate for the energy lost from the dipole part.

I said, "hope," because it appears that since 1967, nobody has yet published a calculation of non-dipole energies based on newer and better data. So that is what I will do below. It turns out that the results quash evolutionist hopes and support creationist models.

3. The International Geomagnetic Reference Field

First, we need more accurate data than what was available in 1967. Figure 3 shows why. This figure reproduces the McDonald and Gunst figure [1967, p. 28, Figure 3(e)] on which Dalrymple based his claim. It shows a curve depicting the "mantle" energy (from the top of the core to the surface) as first decreasing and then increasing. However, the data for the latter part of the curve have a lot of scatter, deviating widely from the curve. For example, in 1965, two points are 1.2 and 1.6% below the curve, while the two others are 1.6 and 6.4% above the curve. A data spread of 8%, four times greater than the 2% upswing the curve alleges, should not give anyone great confidence in the trend.

McDonald and Gunst (1967, p. 30) explain the large scatter as being caused by “errors of analysis of higher degree terms. [In extrapolating surface data down to the top of the earth’s core] small errors in the harmonic coefficients are unduly amplified.” They add, “Likewise in Fig. 3(e) we have not been able to enter meaningful information from the analyses of epoch 1965.”

In 1968, perhaps in response to the above kinds of issues, the International Association of Geomagnetism and Aeronomy (IAGA) began more systematically measuring, gathering, and analyzing geomagnetic data from all over the world. This group of geomagnetic professionals introduced a “standard spherical harmonic representation” of the field called the International Geomagnetic Reference Field, or IGRF. Every five years, starting in 1970, they have published the dipole moment and higher moments of the field out to the 10th harmonic.

Using old data, the IAGA also extended the model back to the year 1900. They now have a standardized set of geomagnetic data spanning the whole twentieth century, 21 epochs of 120 coefficients each. Several journals have concurrently published the most recent version. You can download it free of charge as an ASCII file, a table of over 2500 numbers, from several sites on the Internet (Mandea *et al.*, 2000). One of the Internet sites has an article listing the estimated accuracies, which I have used here (Lowe, 2000). The IGRF is the best set of global geomagnetic data available, accurate enough to give reasonably good values for the non-dipole energies, especially from 1970 until now. Table I shows the data for that period.

4. Calculating the Energy in the Field

In this section, I show how to use the IGRF data to calculate the electrical energy stored in the earth’s magnetic field. If you do not wish to know the mathematical details, just skip to the next section. If you want to study basic electromagnetics, or refresh your memory of it, I recommend Dr. Barnes’s very clear undergraduate textbook, *Foundations of Electricity and Magnetism* (1965).

The magnetic flux intensity $\mathbf{B}$ at a location in space tells us how strongly and in what direction the field would compel a compass needle to point. (Bold font denotes a vector, and all quantities are in SI units.) In regions where there is no electric current, which is approximately true outside the earth’s core, we can represent the magnetic flux intensity as the gradient ∇ of a *magnetic scalar potential* Φ :

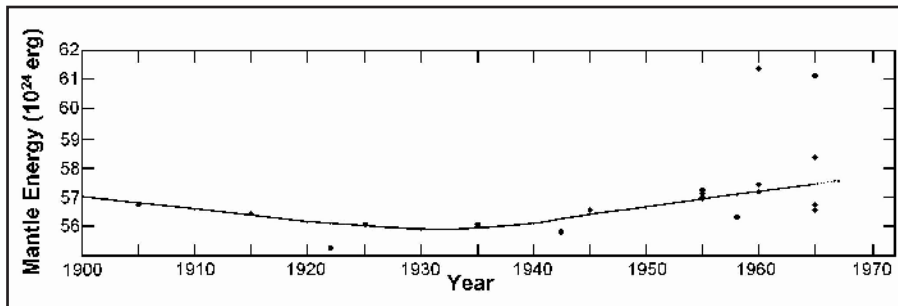


Figure 3. Reproduction of Figure 3(e) from McDonald and Gunst (1967, p. 28), showing “Total poloidal field energy in mantle,” which is the total observable magnetic field energy between the top of the earth’s core and the earth’s surface, not including the energy above the surface. In their graph each energy unit, 10^{24} ergs, corresponds to 10^{17} joules, or 100 petajoules ($1 \text{ PJ} = 10^{15}$ joules).

$$\mathbf{B} = -\nabla\Phi \quad (1)$$

The IGRF model gives a spherical harmonic expansion of the magnetic scalar potential for a given date. I define Φ_n as the component of potential associated with the n^{th} harmonic, so the total magnetic potential becomes

$$\Phi = \sum_{n=1}^N \Phi_n \quad (2)$$

The integer n labeling a harmonic is called the *degree*. Taking the gradient of this equation, we can write the total magnetic flux density as a sum of components:

$$\mathbf{B} = \sum_{n=1}^N \mathbf{B}_n, \text{ where } \mathbf{B}_n = -\nabla\Phi_n \quad (3a,b)$$

The IGRF specifies the n^{th} component of the magnetic potential as a sum of $n + 1$ terms:

$$\Phi_n = a \left(\frac{a}{r} \right)^{n+1} \sum_{m=0}^n (g_n^m \cos m\phi + h_n^m \sin m\phi) P_n^m(\cos\theta) \quad (4)$$

Here a is the mean radius of the earth, 6371.2 km; r is the radial distance from the Earth’s center, ϕ is the longitude eastward from Greenwich, θ is the geocentric colatitude (90° minus latitude), and $P_n^m(\cos\theta)$ is the associated Legendre function of degree n and order m normalized according to the convention of Schmidt (Merrill and McElhinny, 1983, p. 24). The numbers g_n^m and h_n^m are called the *Gauss coefficients*. The IGRF model truncates the expansion at the tenth harmonic, $N=10$.

As many textbooks show, the energy density (joules per cubic meter) stored in the magnetic field $\mathbf{B}$ at a given point is

$$u(r, \theta, \phi) = \frac{1}{2\mu_0} \mathbf{B} \cdot \mathbf{B} \quad (5)$$

The dot represents the scalar product, and μ_0 is the magnetic permeability of the vacuum (which is essentially the same as the magnetic permeability of the earth). To obtain

Table I: International Geomagnetic Reference Field (IGRF) for the years 1970 through 2000 (Mandea *et al.*, 2000). The g 's and h 's are the Gauss coefficients for each degree n and order m , in nanoteslas ($1 \text{ nT} = 10^{-5} \text{ gauss}$).

deg	ord	1970		1975		1980		1985		1990		1995		2000	
n	m	g	h	g	h	g	h	g	h	g	h	g	h	g	h
1	0	-30220		-30100		-29992		-29873		-29775		-29682		-29615	
1	1	-2068	5737	-2013	5675	-1956	5604	-1905	5500	-1848	5406	-1789	5318	-1728	5186
2	0	-1781		-1902		-1997		-2072		-2131		-2197		-2267	
2	1	3000	-2047	3010	-2067	3027	-2129	3044	-2197	3059	-2279	3074	-2356	3072	-2478
2	2	1611	25	1632	-68	1663	-200	1687	-306	1686	-373	1685	-425	1672	-458
3	0	1287		1276		1281		1296		1314		1329		1341	
3	1	-2091	-366	-2144	-333	-2180	-336	-2208	-310	-2239	-284	-2268	-263	-2290	-227
3	2	1278	251	1260	262	1251	271	1247	284	1248	293	1249	302	1253	296
3	3	838	-196	830	-223	833	-252	829	-297	802	-352	769	-406	715	-492
4	0	952		946		938		936		939		941		935	
4	1	800	167	791	191	782	212	780	232	780	247	782	262	787	272
4	2	461	-266	438	-265	398	-257	361	-249	325	-240	291	-232	251	-232
4	3	-395	26	-405	39	-419	53	-424	69	-423	84	-421	98	-405	119
4	4	234	-279	216	-288	199	-297	170	-297	141	-299	116	-301	110	-304
5	0	-216		-218		-218		-214		-214		-210		-217	
5	1	359	26	356	31	357	46	355	47	353	46	352	44	351	44
5	2	262	139	264	148	261	150	253	150	245	154	237	157	222	172
5	3	-42	-139	-59	-152	-74	-151	-93	-154	-109	-153	-122	-152	-131	-134
5	4	-160	-91	-159	-83	-162	-78	-164	-75	-165	-69	-167	-64	-169	-40
5	5	-56	83	-49	88	-48	92	-46	95	-36	97	-26	99	-12	107
6	0	43		45		48		53		61		66		72	
6	1	64	-12	66	-13	66	-15	65	-16	65	-16	64	-16	68	-17
6	2	15	100	28	99	42	93	51	88	59	82	65	77	74	64
6	3	-212	72	-198	75	-192	71	-185	69	-178	69	-172	67	-161	65
6	4	2	-37	1	-41	4	-43	4	-48	3	-52	2	-57	-5	-61
6	5	3	-6	6	-4	14	-2	16	-1	18	1	17	4	17	1
6	6	-112	1	-111	11	-108	17	-102	21	-96	24	-94	28	-91	44
7	0	72		71		72		74		77		78		79	
7	1	-57	-70	-56	-77	-59	-82	-62	-83	-64	-80	-67	-77	-74	-65
7	2	1	-27	1	-26	2	-27	3	-27	2	-26	1	-25	0	-24
7	3	14	-4	16	-5	21	-5	24	-2	26	0	29	3	33	6
7	4	-22	8	-14	10	-12	16	-6	20	-1	21	4	22	9	24
7	5	-2	23	0	22	1	18	4	17	5	17	8	16	7	15
7	6	13	-23	12	-23	11	-23	10	-23	9	-23	10	-23	8	-25
7	7	-2	-11	-5	-12	-2	-10	0	-7	0	-4	-2	-3	-2	-6
8	0	14		14		18		21		23		24		25	
8	1	6	7	6	6	6	7	6	8	5	10	4	12	6	12
8	2	-2	-15	-1	-16	0	-18	0	-19	-1	-19	-1	-20	-9	-22
8	3	-13	6	-12	4	-11	4	-11	5	-10	6	-9	7	-8	8
8	4	-3	-17	-8	-19	-7	-22	-9	-23	-12	-22	-14	-21	-17	-21
8	5	5	6	4	6	4	9	4	11	3	12	4	12	9	15
8	6	0	21	0	18	3	16	4	14	4	12	5	10	7	9
8	7	11	-6	10	-10	6	-13	4	-15	2	-16	0	-17	-8	-16
8	8	3	-16	1	-17	-1	-15	-4	-11	-6	-10	-7	-10	-7	-3
9	0	8		7		5		5		4		4		5	
9	1	10	-21	10	-21	10	-21	10	-21	9	-20	9	-19	9	-20
9	2	2	16	2	16	1	16	1	15	1	15	1	15	3	13
9	3	-12	6	-12	7	-12	9	-12	9	-12	11	-12	11	-8	12
9	4	10	-4	10	-4	9	-5	9	-6	9	-7	9	-7	6	-6
9	5	-1	-5	-1	-5	-3	-6	-3	-6	-4	-7	-4	-7	-9	-8
9	6	0	10	-1	10	-1	9	-1	9	-2	9	-2	9	-2	9
9	7	3	11	4	11	7	10	7	9	7	8	7	7	9	4
9	8	1	-2	1	-3	2	-6	1	-7	1	-7	0	-8	-4	-8
9	9	-1	1	-2	1	-5	2	-5	2	-6	2	-6	1	-8	5
10	0	-3		-3		-4		-4		-3		-3		-2	
10	1	-3	1	-3	1	-4	1	-4	1	-4	2	-4	2	-6	1
10	2	2	1	2	1	2	0	3	0	2	1	2	1	2	0
10	3	-5	3	-5	3	-5	3	-5	3	-5	3	-5	3	-3	4
10	4	-1	4	-2	4	-2	6	-2	6	-2	6	-2	6	0	5
10	5	6	-4	5	-4	5	-4	5	-4	4	-4	4	-4	4	-6
10	6	4	0	4	-1	3	0	3	0	3	0	3	0	1	-1
10	7	1	-1	1	-1	1	-1	1	-1	1	-2	1	-2	2	-3
10	8	0	3	0	3	2	4	2	4	3	3	3	3	4	0
10	9	3	1	3	1	3	0	3	0	3	-1	3	-1	0	-2
10	10	-1	-4	-1	-5	0	-6	0	-6	0	-6	0	-6	-1	-8

the total energy E contained in the magnetic field outside the Earth's core, we must volume-integrate Equation (5) from the radius of the core, $b = 3471$ km, out to infinity:

$$E = \int_b^\infty \int_0^\pi \int_0^{2\pi} u(r, \theta, \phi) r^2 \sin \theta \, d\phi \, d\theta \, dr \quad (6)$$

Now examine in more detail the energy density u which goes into this integral. Expanding $\mathbf{B}$ in Equation (5) by using the sum in Equation (3a) gives us:

$$u(r, \theta, \phi) = \frac{1}{2\mu_0} \left(\sum_{n=1}^N B_n^2 + 2 \sum_{n \neq n'}^N \mathbf{B}_n \cdot \mathbf{B}_{n'} \right) \quad (7)$$

In the first summation, B_n is the magnitude of the vector $\mathbf{B}_n$. The second summation contains the cross-terms resulting from squaring the sum in Equation (3a). In doing the angular part of the volume integral of Equation (6), we find that the cross-terms drop out because of the orthogonality of the spherical harmonic functions chosen for Equation (4) (Merrill and McElhinny, 1983, p. 24). That leaves us with a much simpler expression,

$$E = \sum_{n=1}^N E_n \quad (8)$$

where each of the energy components is

$$E_n = \frac{1}{2\mu_0} \int_b^\infty \int_0^\pi \int_0^{2\pi} \nabla \Phi_n \cdot \nabla \Phi_n r^2 \sin \theta \, d\phi \, d\theta \, dr. \quad (9)$$

Using Equation (4) to expand Equation (9), and using orthogonality to eliminate cross-terms in m , we get the energy E_n of the n^{th} harmonic in a useful form:

$$E_n = \left(\frac{a}{b} \right)^{2n+1} \left(\frac{2\pi a^3}{\mu_0} \right) \left(\frac{n+1}{2n+1} \right) G_n^2 \quad (10)$$

where we recall that a and b are the radii of the earth's surface and core, respectively, and where G_n^2 is the sum of the squares of the Gauss coefficients for the n^{th} harmonic:

$$G_n^2 = \sum_{m=0}^n \left[(g_n^m)^2 + (h_n^m)^2 \right] \quad (11)$$

McDonald and Gunst [1967, p. 27, Equations (3.7), (3.8)] give this result in a slightly different form. First, to change from their Gaussian units to our SI units, we must replace their relative permeability μ with $\mu_0/4\pi$. Second, we must change their R_e to my a , and their ρ_e to my a/b . Third, we must add their equations (3.7) and (3.8) to get the total energy for all harmonics. When we sum my Equation (10) over all harmonics as in Equation (8), we get the same result.

As another check, the numerical values of my results using IGRF data agree, within five percent, with the graphs of McDonald and Gunst for the period in common having the least scatter, 1915 to 1925. The small disagreement is due to differences of several percent in the Gauss coefficients

in the two data sets. The differences arose from different ways of analyzing the raw magnetic data. For example, McDonald and Gunst for practical reasons truncated their analysis with $N = 6$, whereas the IGRF went out to the tenth harmonic. Since the difference in data accounts for the difference in results satisfactorily, the approximate agreement is further support for equations (10) and (11).

The factor a/b in Equation (10) is the ratio of the earth's surface radius to the radius of the core. Since the equation raises this factor, 1.835, to the power $2n + 1$, the higher harmonics have much more weight relative to the lower harmonics. That is why it is very important to secure accurate data for the higher harmonics.

Equations (10) and (11) give the total magnetic energy outside the core radius, $r=b$. Although magnetic fields and energies also exist in the core as well as outside it, observations of the field outside the core cannot determine the field in the core. Different distributions of electric currents, fields, and energy in the core can give the same field outside the core. Furthermore, "toroidal" fields could exist entirely within the core. However, indirect evidence indicates toroidal fields are small, as I mention in section 2.

A spherical harmonic expansion of fields inside the core would invert the radial factors, so that they would be of the form $(r/b)^{n+1}$ [Smythe, 1989, Section 7.12, Equation (5)]. That implies that field intensities in the core should not be drastically different than those at its surface. Since $(r/b) \leq 1$ in the core, the lower harmonics should dominate. These considerations suggest that the ratio of non-dipole to dipole energy would not change much if we could somehow include the contribution of fields in the core. Anyway, we can do no better than to use the fields we can measure. Thus, the E of Equation (8) is the total *observable* energy.

Benton and Alldredge [1987, p. 266, Equations (2), (3)] give the energy only above the earth's surface, $r=a$. They define G_n^2 with a multiplying factor that I have instead placed into the final energy equation. If we put $(a/b) = 1$ into my equations, the result agrees with theirs.

A final caveat is that extrapolating the IGRF model down to the top of the core does not account for electric currents in the mantle and magnetization in the crust. However, the electrical conductivity of the core is much greater than that of the mantle or crust, and evidence suggests that magnetic sources outside the core are relatively small. For example, it appears that crustal magnetization only affects harmonics higher than the tenth (Benton and Alldredge, 1987, p. 271, Figure 2).

5. Results and Accuracy

Table II and Figure 4 show the energies contained in the earth's magnetic field from the years 1900 to 2000, according to the IGRF data (of which Table I is a sample) and

Table II: Dipole and Non-dipole Energies in the Earth's Magnetic Field. Calculated by Equations (10) and (11) from IGRF geomagnetic data for the entire twentieth century (Mandea *et al.*, 2000). Energies are in petajoules (1 PJ = 10^{15} joules). The rms error is the root mean square difference, in nanoteslas, between the magnetic field intensity B at the earth's surface according to the IGRF model and the observed values, as estimated by Lowe (2000). The sigmas (σ) are the corresponding errors in the dipole, nondipole, and total energies.

Year	1900	1905	1910	1915	1920	1925	1930	1935	1940	1945	1950
Dipole Energy	5514	5487	5449	5401	5349	5303	5263	5233	5213	5193	5179
Quadrupole E	196	202	209	216	221	227	235	242	249	260	269
Octopole E	284	290	299	310	323	337	351	366	382	399	411
4th Harmonic	311	317	323	329	333	336	340	344	351	371	375
5th Harmonic	158	156	153	151	149	148	147	148	151	159	163
6th Harmonic	157	159	160	163	165	168	170	173	175	170	169
7th Harmonic	95	94	95	95	96	95	95	94	93	77	79
8th Harmonic	60	60	60	60	63	63	65	66	67	70	110
9th Harmonic	87	87	87	87	88	88	90	92	95	211	160
10th Harmonic	55	55	55	54	55	55	55	55	55	183	256
Total Energy	6916	6906	6890	6866	6843	6820	6810	6813	6830	7093	7172
Dipole Energy	5514	5487	5449	5401	5349	5303	5263	5233	5213	5193	5179
Nondipole E	1402	1420	1441	1465	1494	1517	1548	1580	1617	1900	1993
σ Total E	25	25	24	24	24	24	24	23	23	70	54
σ Dipole E	25	24	24	24	24	24	23	23	23	69	54
σ Nondipole E	47	47	46	46	46	46	45	45	45	139	108
rms error	100	100	100	100	100	100	100	100	100	300	233

Year	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000
Dipole Energy	5179	5161	5133	5103	5062	5019	4979	4934	4896	4860	4831
Quadrupole E	269	279	288	296	306	317	331	344	356	369	383
Octopole E	411	423	431	439	445	452	461	469	478	486	492
4th Harmonic	375	373	372	368	364	358	350	344	341	338	333
5th Harmonic	163	171	178	179	184	188	190	189	187	186	184
6th Harmonic	169	169	165	160	150	142	136	130	126	123	119
7th Harmonic	79	85	89	98	100	104	112	118	119	121	120
8th Harmonic	110	89	89	77	74	75	84	91	95	100	116
9th Harmonic	160	53	57	103	99	100	104	102	102	99	101
10th Harmonic	256	76	51	46	42	43	53	54	51	51	58
Total Energy	7172	6879	6853	6869	6827	6797	6800	6775	6751	6732	6737
Dipole Energy	5179	5161	5133	5103	5062	5019	4979	4934	4896	4860	4831
Nondipole E	1993	1718	1720	1767	1764	1778	1821	1842	1855	1872	1906
σ Total Energy	54	39	23	11	11	11	2	11	11	22	11
σ Dipole E	54	38	23	11	11	11	2	11	11	22	11
σ Nondipole E	108	76	45	23	22	22	4	22	22	44	22
rms error	233	167	100	50	50	50	10	50	50	100	50

equations (8), (10), and (11). The dipole energy is E_1 , the non-dipole energy is the sum of E_2 through E_{10} , and the total energy E is the sum of E_1 through E_{10} . The last row shows Lowes's (2000) estimates of rms error in B averaged over the earth's surface. The rows labeled with sigmas (σ) show the corresponding errors in the various calculated energies.

The most important thing to notice in these numbers is the *great loss of energy* from the field. According to the IGRF data, the total observable energy decreased over 2.6% during the twentieth century. This loss of 180 ± 34 petajoules (1 petajoule = 1 PJ = 10^{15} joules = 1 billion megajoules) amounts to 50 billion kilowatt-hours of electrical energy—enough to power over five million U.S. households for a year.

Notice that the energy loss was steady except during two epochs, 1945 and 1950. Between 1940 and 1950, according to the IGRF model, total energy jumped up by a remarkable +4.7%. Then from 1950 to 1955, the total energy plummeted even more rapidly by almost the same amount (−4.2% of the 1940 value), to a value about equal to what the century-averaged trend (curve fit in Figure 4) would give for 1955. In other words, though there may have been a temporary “pulse” of energy that decade, it disappeared and left no lasting impression on the long-term energy trend.

Moreover, *all* of the pulse came from the non-dipole component. Notice that during the period in question, the dipole energy continued its steady decay and suffered no corresponding pulse in the negative direction. However we interpret the pulse, the steady dipole decay contradicts Dalrymple's conjecture: that increases in non-dipole energy ought to be fed by losses in dipole energy.

The pulse of non-dipole energy may not be real. It turns out that essentially all of the pulse comes from a roughly 300% rise and fall in the energy of the 9th and 10th harmonics alone. According to McDonald and Gunst (1967, pp. 29–30), harmonics higher than the 6th had errors large enough during that period to cause problems. As Figure 3

shows, the energy data have a large scatter during that time. Figure 5 shows the estimates I mentioned above by one of the IGRF authors (Lowes, 2000) of the rms errors in B predicted by the model during the twentieth century. Notice that there is a large bump in error at the same time as the alleged pulse. This casts more doubt on the reality of the pulse. However, if it is real, I offer a possible explanation in the next section.

Because of the efforts of geomagnetists after 1968 to measure and characterize the field more systematically, the data from 1970 to 2000 are much more accurate than the earlier data. That is especially so in years when satellite data added greatly to the precision.

Figures 6 and 7 show the dipole and non-dipole energies during the accurate period. The straight lines in the

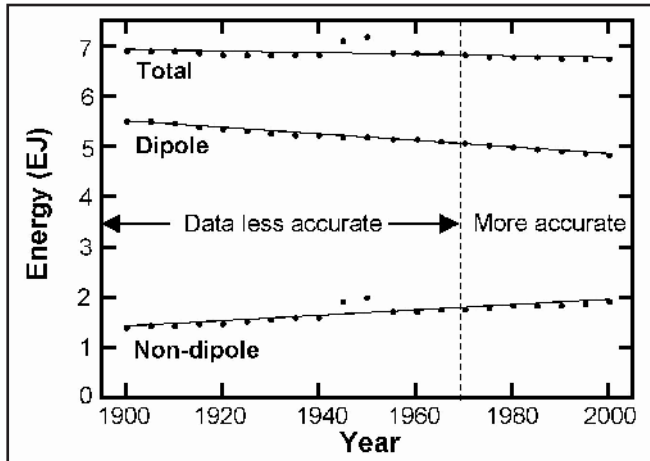


Figure 4. Dipole, non-dipole, and total energies computed by Equations (10) and (11) from the International Geomagnetic Reference Field (IGRF) for the entire twentieth century. Energy units are exajoules ($1 \text{ EJ} = 10^{18} \text{ joules} = 1000 \text{ PJ}$). From 1970 onward, the non-dipole data are more accurate than for earlier years. Sections 5 and 6 discuss the “pulse” in the non-dipole energy during 1945 and 1950. Lines are least-squares exponential fits that include the points from those two epochs.

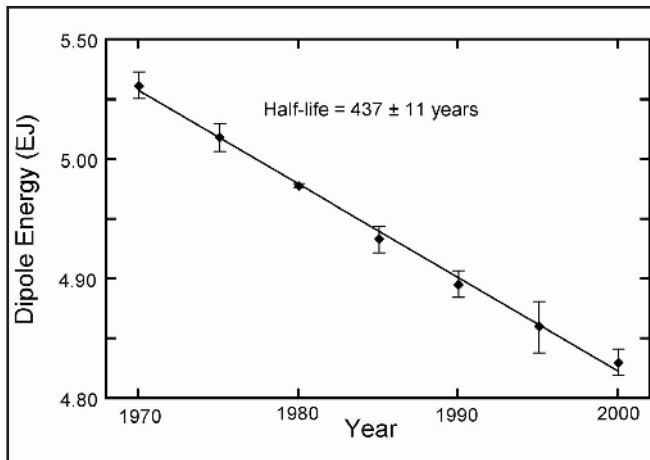


Figure 6. Dipole energy decrease from 1970 through 2000.

figures are least-squares exponential curve fits. The fits show that during those 30 years the dipole lost $235 \pm 5 \text{ PJ}$, whereas the non-dipole part gained only $129 \pm 8 \text{ PJ}$. Contrary to Dalrymple’s hope, the sum of the two energies *decreased*.

Figure 8 shows the decline of the total (dipole plus non-dipole) observable energy from 1970 to 2000, again with an exponential curve fit. The fit gives an energy decay time of $2113 \pm 239 \text{ years}$, or an energy half-life of $1465 \pm 166 \text{ years}$. That means the net loss of energy during the 30-year period was $96 \pm 11 \text{ PJ}$. In 30 years, $1.41 \pm 0.16\%$ of all the observable magnetic energy disappeared.

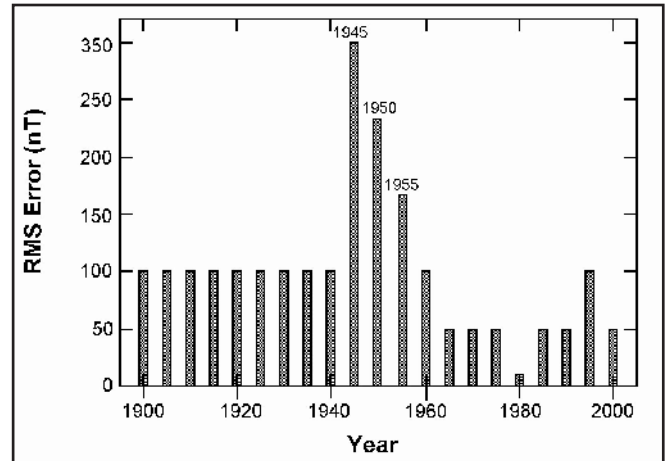


Figure 5. Estimated root mean square error in the IGRF magnetic field intensity B at the earth’s surface (Lowe, 2000), in nanoteslas.

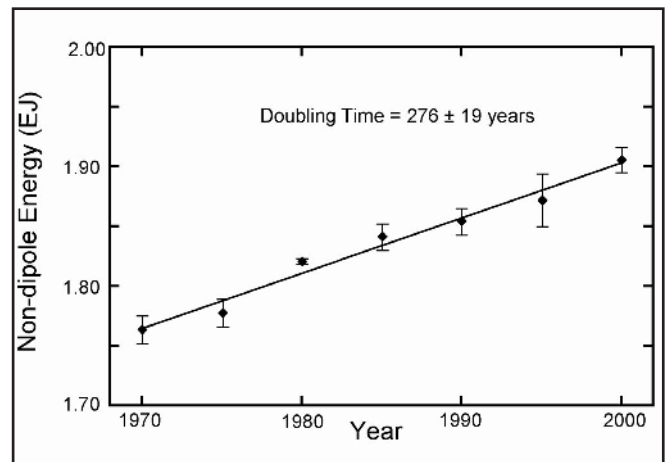


Figure 7. Non-dipole energy increase from 1970 through 2000.

6. Where the Energy Went

As far as we know, natural processes cannot destroy energy, so the energy lost from the observable magnetic field had to go somewhere. Either (1) it went into magnetic fields hidden from our view inside the core, or (2) the processes in the core converted it into some other form of energy.

Possibility (1) is unlikely, because several natural processes expel magnetic flux (lines of force) upward out of the core (Humphreys, 1990, p. 131). These are *transport*, *buoyancy*, and *diffusion* of magnetic flux lines. First, according to Alfvén’s theorem and observations (Shercliff, 1965), upward flows of the electrically conductive fluid in the core sweep magnetic flux up with them to the surface, as Figure 9(a) shows. Second, magnetic buoyancy (Parker, 1983; Wissink, *et al.*, 2000) tends to prevent flux from going back down with downward flows of the fluid. Third,

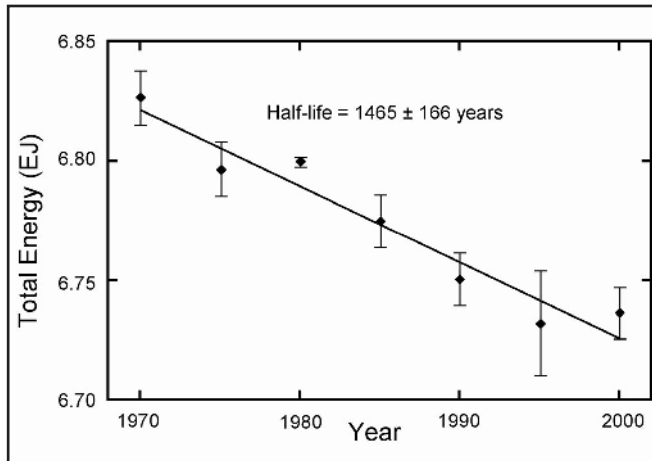


Figure 8. Total energy decrease from 1970 through 2000.

magnetic diffusion pushes flux upward out of the core into the less conductive mantle rock, Figure 9(b). Thus, flux tends to emerge from the core, not disappear back into it.

My 1990 paper shows that as upwelling core fluid expels magnetic flux, it also generates loops of new lines of force in the reversed direction. If the motions are fast enough to generate new flux lines faster than dissipative processes (discussed below) can destroy them, then eventually the new flux loops can combine and emerge from the core as large loops of flux of reversed direction from the previous field. However, as I showed in the paper, the new flux is never as great as the old flux, because of dissipative processes. Thus, the new reversed (mostly dipole) field could never have as much energy as the previous field.

The only demonstrated possible core process I know of which might add energy to a magnetic field is the stretching-out of lines of force (by differential rotation of the fluid) into a “toroidal” east-west direction, as possibly happens on the Sun (Humphreys, 1986, p. 116). The energy for the stretching comes from the motions of the fluid. However, as I pointed out in section 2, observational evidence weighs against strong toroidal fields existing now in the earth’s core.

One process we can be certain about is *ohmic dissipation* or “joule heating.” Because the core is not a perfect electrical conductor, its electrical resistance will continually be eroding the electrical currents in the core, converting magnetic field energy into heat. As I mentioned in section 2, the observed rate of loss of magnetic energy is quite consistent with observed electrical resistivity of likely core materials under core conditions. Thus, the missing field energy is most likely to have become heat in the earth’s core.

What about the general increase of non-dipole energy? My model would suggest it is simply due to the motions of the fluid “chopping up” dipole flux lines of force into

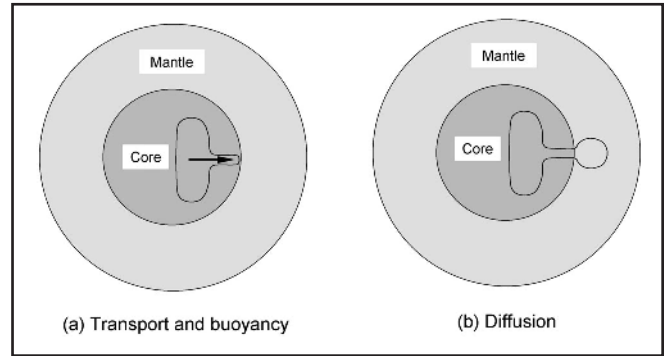


Figure 9. A magnetic line of force emerges out of the earth’s core. (a) An upflow of the electrically conductive core fluid pushes a section of the line up to the outer surface of the core, and magnetic buoyancy keeps much of the line from descending with downflows. (b) The line of force diffuses upward out of the core.

smaller loops of flux, which will then dissipate their energy faster. McDonald and Gunst (1967, p. 25, *italics mine*) agree:

This [nondipole energy increase] leads us to conclude that the zonal dipole field is being driven destructively to smaller values by fluid motions which transform its magnetic energy into that of the near neighboring higher-order modes [harmonics] rather than expend it more directly as joule heat. *The joule heating rate associated with the original dipole energy necessarily increases*, however, since the free decay period decreases monotonically with increased degree of mode.

In other words, the smaller loops of flux will dissipate their energy as heat even faster than the larger loops do. So presently fluid flows are converting some of the dipole energy to into non-dipole energy. However, rapid ohmic dissipation of the non-dipole energy is continually destroying much of the non-dipole energy even while the fluid flows are generating it.

According to both my model and the picture given by McDonald and Gunst, the rate of conversion from dipole to non-dipole energy should be proportional to the amount of dipole flux. For example, if there were no dipole flux, no energy would be added to the non-dipole parts. In the future, when the dipole flux will be weaker, the conversion of dipole to non-dipole energy will slow down. But the ohmic dissipation of non-dipole energy will proceed unabated. At some time, dissipation will exceed production. After that time, even the non-dipole energy will decrease.

It is interesting that Dalrymple did not seem to perceive the implications of the McDonald and Gunst quote above. If he had, he would have had less reason to hope for the long-term preservation of magnetic energy.

What about the pulse of magnetic energy in the 9th and 10th harmonics in 1945 and 1950? If it was real, it may have

been caused by the expulsion of a medium-sized loop of flux completely out of the core into the mantle, as Figure 10 shows. Since the electric currents maintaining such a loop would be entirely within the low-conductivity mantle, the magnetic energy of the loop would dissipate quickly, not contributing to the accumulation of non-dipole energy. However, it may have had some effect on the rotation of the earth's mantle, perhaps eventually resulting in the "geomagnetic jerk" observed in 1969 (Courillot and Le Mouél, 1984).

Conclusion:

The Earth's Magnetic Field is Young

The trend in the IGRF data from the most accurate period, 1970 to 2000, is very clear. During that period the total energy—dipole plus non-dipole—in the observable geomagnetic field decreased quite significantly, by 1.4%. Though the data over the previous part of the century are less accurate, there was still an overall decrease of total energy. According to my geomagnetic model, whose general features agree with paleomagnetic and archeomagnetic data, the total field energy has always decreased at least at today's rate, and it will continue to do so in to the future (Humphreys, 1990).

Today's energy decay rate is so high that the geomagnetic field could not be more than a few dozen millennia old. Moreover, during the rapid polarity reversals of the Genesis Flood, and during the large fluctuations of surface field **B** for millennia after the Flood, the rate of energy loss was much greater than today's rate. That shortens the age of the field even more. In the absence of any workable analytical theory (or data) to the contrary from the evolutionists, these data are quite consistent with the face-value Biblical age of the earth, about 6000 years.

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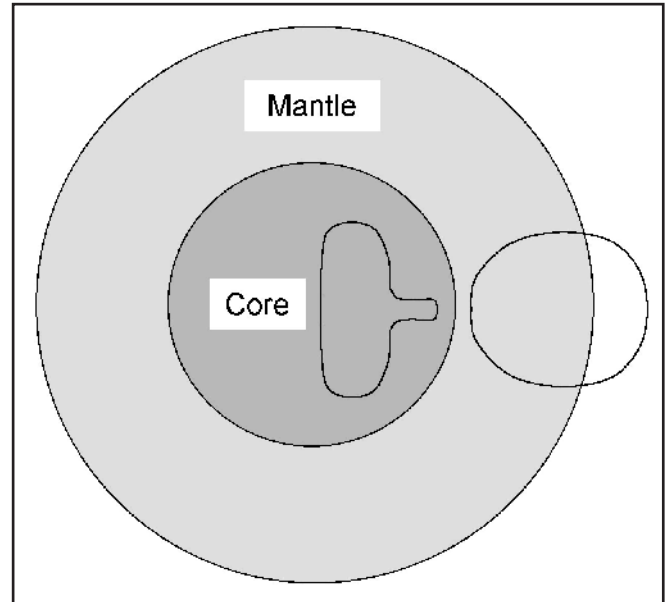


Figure 10. Medium-sized magnetic lines of force move completely out of the core into the mantle. Possibly such an event caused the non-dipole energy “pulse” of 1945–1950.

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Book Review

Geognosy or the Facts and Principles of Geology Against Theories by David N. Lord Franklin Knight, New York. 1855, 1857 second edition, 410 pages, \$20

Though Lord (1791–1880) wrote one and one-half centuries ago, his ideas are still valuable for creation scientists today. Editor of “The Theological and Literary Journal,” he was well-read for numerous geologists such as Lyell, Hitchcock, Buckland, de la Beche, Sedgwick, even being acquainted with the early work of another theologian-turned-naturalist: Charles Darwin’s “Voyage of the Beagle.”

His purpose was to refute the notion that the *geologic strata themselves* proved the earth was formed earlier than the Scripture teaches (p. 398). The problem was that old-earth geological theory (OEGT) had become a major

source, “of skepticism aided ... not only by the inconsiderate concessions of many religious men but in a still worse manner by unjustifiable and absurd methods by which it has been attempted to blend the history of creationism in Genesis into harmony with their [OEGT] speculations which contradict it and impeach it of fatal error” (p. 406).

Lord was not against geological study or the facts of geology (p. 17). He challenged the *inference* that these facts point to an ancient earth. Eons of geological time, “instead of being scientifically demonstrated is a mere deduction from a conjecture and without value” (p. 60). The con-

ture he objected to is that exactly the same forces operated in the past at precisely the same rates as observed today (pp. 75–76). Especially, he suggested that past rates of geological energy were much higher than observed today (pp. 69, 78, 262, 293, etc.), citing the respected geologist Bakewell's writings (pp. 340–341, also 179–185). Indeed, numbers of neo-catastrophist geologists now concur with Lord for this point (though many of them still believe in OEGT, see Reed, 2000, p. 170, Figure 2). He mentioned geologists' extreme sensitiveness that they were unable to reconcile their theory with Scripture (p. 10), also their claim that their discipline was off-limits to theologians even though they denied the biblical teaching of a young earth (p. 61).

Some of the geologic evidence he mentioned is familiar to creation scientists: polystrate fossils (p. 368); the strata were plastic when uplifted because of folds (p. 378); perfect preservation of fish shows they were covered quickly before decomposition began (p. 369); erosion features occurred when sediment was soft [geologists of his day recognized that the sediment was soft when uplifted, though not when it was eroded] (p. 380); even decomposition throughout strata, such as coal layers (p. 366); strata deposited over a large area is inexplicable in terms of today's geologic processes (pp. 354–355); and massive tertiary sediments that probably occurred suddenly when the continents were uplifted from the sea (pp. 386–390). He observed that rivers are not now able to cause widespread depositional layers across the ocean floor as OEGT postulates (pp. 226–227, 245). Today the majority of sediment never reaches the sea. Coal, he said, was not buried *in situ*, instead being transported by water (p. 364).

He wrote a devastating critique of the compromise idea now known as the Gap Theory. Gap theorist Buckland suggested that dense vapors blocking sunlight from the earth were somewhat cleared on Day One (i.e., the creation of light), then the sun became visible on Day Four. However, Lord points out that the atmosphere was not created until Day Two so it would not have been present to block the sunlight on or before Day One (p. 106). Another problem for the Gap Theory is that light was necessary for past life, though it is not created until Day One, after the fossilized world was supposedly ruined (p. 86). Furthermore the Gap Theory suggests that the atmosphere for the ruined world was destroyed, then recreated on Day Two for the restoration (pp. 117–118). Granite mountains were thought to date from before the ruined world. However, the Bible says dry land appeared only on the third day causing another contradiction. One of the purposes for the sun's creation on the fourth day was "for days, seasons, years" If the earth was in the sun's orbit for eons before the Genesis 1–2 supposed recreation, then the sun could not have been created on the fourth day for "days, seasons, or years" (pp. 137–138). He pointed out deficiencies in the Day-Age Theory as well as the Gap Theory.

Lord was prophetic when he said "no skill can ever bring [OEGT] into harmony with either revelation or nature" (p. 120). Now, after another 1-1/2 centuries of fruitless attempts, no progress has been made reconciling revelation with OEGT. (The currently popular Framework Theory holds that the first chapters of Genesis are fictitious history; they never really occurred.) The author points out that the inspired record of creation was not the guide of the OEGT's faith nor of any authority with them in the determination of their system (p. 145). Lord said that if OEGT is right then the record of Noah's flood was a "consummate error" (p. 168), though he didn't often mention the Flood. He wrote "had it been the object of [OEGT's] authors to devise a theory in conflict in every element with the inspired history, they could not have formed one more conspicuously and absolutely of that character" (p. 171–172). In fact Christianity's 19th century archenemy, Huxley, used the argument that because the Flood story is historically false, Christian theology is falsified (cited by Gladstone, 1891, pp. 286–7).

Lord's fascinating book at least refutes Ronald Numbers' (1995) speculation that young-earth creation was a Seventh Day Adventist invention since he published his book decades before that religion began. [A mistake repeated uncritically by Mark Noll (1994) and others.] Lord knew about the British Scriptural Geologists (that Mortenson, 1997–2000, has researched), though he wrote their scientific prestige wasn't good. Stiling (1995) thought the Scriptural Geologists were remarkably similar to the recent flood-geologists. Lord's *Geognosy* was a carefully researched theological-geological deconstruction of OEGT.

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Variability of Skull Shape in the Domestic Dog and Its Implications for Variability in Other Mammals and Humans since the Flood

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Abstract

The domestic dog (*Canis familiaris*) has been used by creationists as an example of a creature showing great variability in a short time and as an example of how to account for the variation in living beings (including humans), since the Flood. The spectac-

ular diversity of the domestic dog species occurs not only in size but also in shape. This variability excludes the morphological differences from other wild canids, except wolf-like canids (gray wolf, coyote and jackal).

Introduction

Living beings undergo variation but they do so within their "kinds." (e.g. Marsh, 1976; Lester and Bohlin, 1984; and Brand and Gibson, 1993). Variation is limited, but when it does occur, it can transpire rapidly. This swiftness has been discussed by creationist authors (e.g. Jones, 1982; Lester and Bolin, 1984; Brand and Gibson, 1993; Woodmorappe, 1996), as well as evolutionists (e.g. Johnston and Selander, 1964; Losos, 1997; Reznick et al., 1997).

A familiar example of such great and rapid variation is that of the domestic dog. The variation of dog skulls in both size and shape is quite extensive, but their overall morphology still remains close to that of other wolf-like canids.

Studies of the cranial shape variation in the domestic dog can be useful to help us speculate about morphologic differences that may have been produced in other mammals (including humans) since the Flood.

Materials and Methods

The set of canid skulls from which these measurements have been taken belong to the author. The text refers to small and large domestic dogs. The prosthion-condyle length (see Figure 1) is the measure of choice for differentiating between small or large domestic dogs. The range of size in the small dogs is 105.4 mm to 131.8 mm (105.4 mm plus 25 per cent of 105.4 mm). The range of size in large domestic dogs is 168.8 mm to 225.1 mm (225.1 mm minus 25 per cent of 225.1 mm). The addition or subtraction of 25 per cent (a proportion) is in each case arbitrary but use-

ful for distinguishing between large and small dogs. The smaller domestic dog in this study has a 105.4 mm prosthion-condyle length, and that of the larger domestic dog is 225.1 mm. The range of size in the intermediate group is 131.9 mm to 168.7 mm. In Figure 1 the prosthion-condyle length is 185.5 mm in skull "a" and 109.2 mm in skull "b".

The triangles formed by joining three points in the saggital plane of the cranium of canids have been used to study the variation in this plane. The three vertices of the triangle correspond to the points prosthion-bregma-condyle, as seen in Figure 1.

The comparison of the shapes of the triangles (saggital planes) is possible by standardizing the scale of each triangle examined. Thus, we arbitrarily assign a prosthion-condyle length value of 100, coordinates in Cartesian axes (100.0) for the condyle, and (0.0) for the prosthion. After standardizing each triangle it is possible to plot their shapes as a scatter-plot of the coordinates (Figure 2). The coordinate shapes are formed by the bregma coordinates. All the information about the shape is contained in this point or parameter called the "bregma landmark", a method that was originally developed by Wilson (1990).

Eighteen variables (Table I) were measured and used for the Principal Component Analysis, PCA. The PCA process transforms the original variables (eighteen in this study) into new variables, called Principal Components. The eighteen PCs are PC1 to PC18. This multivariate analysis involves calculating the principal axes of the ellipsoids constituted by a scatter plot of specimens (dots) defined by his variables, in Cartesian coordinate systems. With three variables are tridimensional ellipsoids, but in this study there is actually a "space" of eighteen dimensions. The principal axes represent the directions of maximum variation (characteristic vectors), that correspond to

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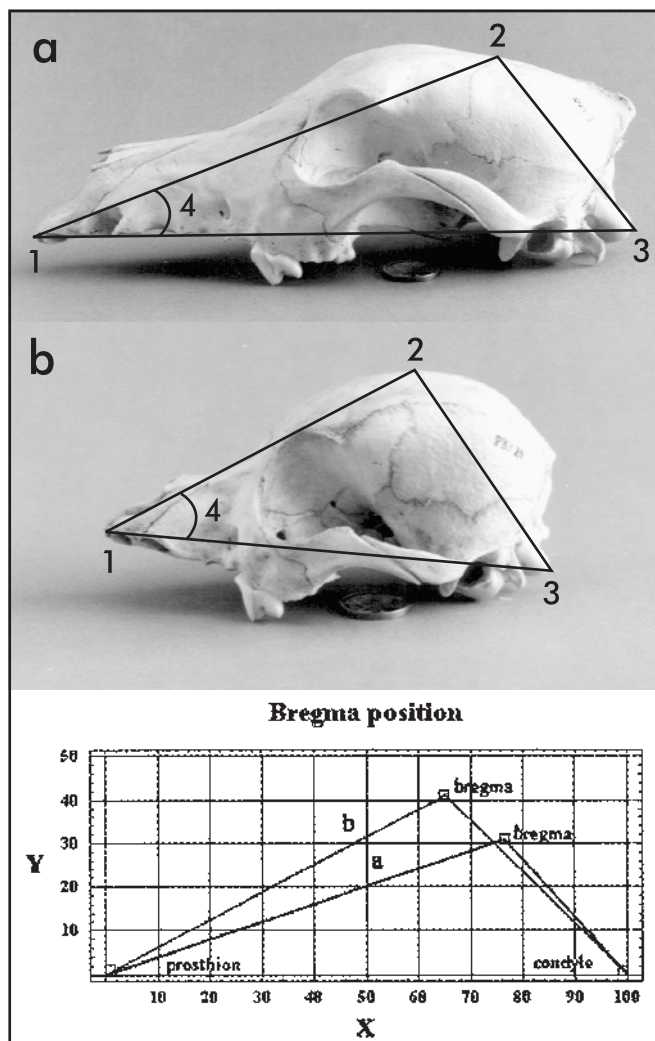


Figure 1. Large (a) and small (b) domestic dog skulls. The actual prosthion-condyle length of a is 185.5 mm, and the actual prosthion-condyle length of b is 109.2 mm. The graph provides a comparison between standardizing triangles prosthion-bregma-condyle of skulls a and b. Skull b is relatively taller than skull a. For a comparison of bregma position in different canid skulls see Figure 2. Axis X on this figure shows the relative “x” coordinate of the bregma while axis Y shows the relative “y” coordinate of the bregma. Coin in the photographs is 17.5 mm. Key: 1–prosthion, 2–bregma, 3–condyle, 4–facial angle.

principal variance components. Because PC axes are perpendicular, variation on one axis is not correlated to another and can be used to define independent patterns of variation in the group of crania studied. It has been proved that the effects of size that usually dominate PC1 (in this study 83.4 per cent of variance was attributable to differences of size) can be viewed independently, to some degree, from variability of shape (Lemen, 1983). The contribution of the PC2 to the variance is 6 per cent, and that of PC3 is 4.6 per cent. Besides this, PC2 and PC3 both re-

Table I. Description of measurements.

- | | |
|------|--|
| (a) | M ¹ L. Length of upper first molar. |
| (b) | M ¹ W. Width of upper first molar. |
| (c) | M ² L. Length of upper second molar. |
| (d) | M ² W. Width of upper second molar. |
| (e) | P ⁴ L. Length of upper fourth premolar. |
| (a') | Condylbasal length. |
| (b') | Maximum skull width across the zygomatic arches. |
| (c') | Skull breadth across the mastoid process. |
| (d') | Postorbital proces width. |
| (e') | Interorbital breadth. |
| (f) | Minimum width of cranium at postorbital constriction. |
| (g') | Cranial vault width to parietal-temporal suture. |
| (i') | Face length. |
| (j') | Length of auditory bulla from the carotid channel to the farthest back area. |
| (k') | Basiscranial axis length. |
| (p') | Basisphenoid-presphenoid suture to bregma length. |
| (q') | Opisthion–bregma length. |
| (r') | Prosthion-bregma length. |

For additional information on cited landmarks, see García-Pozuelo-Ramos (1998,1999).

veal readily interpretable patterns that permit the differentiation of domestic and wild dogs (PC2 axis in Figure 3), and small and large domestic dogs (PC3 axis in Figure 3). On the contrary, the contribution of the PC4's to PC18 to the variance is 6 per cent, and did not reveal any readily interpretable patterns of the differentiation for canids (data not shown). Hence I used PC2 and PC3 in the analysis of the canid shape. The variable loading on each PC provides an indication of the relative contribution of each measurement (eighteen in this study) to the variation along that component (Table II). Samples were assessed by a PCA on the correlation matrix. The data were log transformed since the raw data would overemphasize large traits such as the prosthion-condyle length, which, is approximately 15 times the length of upper first molar, a small trait.

Results and Discussion

The variability of the domestic dog skulls is evident when we look at two different skulls. Figure 1 shows the crania of the two representative adult dogs (1a and 1b) belonging to different breeds. The landmarks prosthion, condyle, and bregma create a triangle which allows us to study the variability in the sagittal plane of the cranium. The graph shows these standardized triangles plotted on coordinates. The landmark prosthion is located at the origin of the coordinates (0.0), and the landmark condyle on the X axis (100.0). The measurements have been standardized to

Table II. Table of Component Weights in Principal Component Analysis(PCA)

Measure	PC 1	PC2	PC3
a	0.23492	0.10473	0.36075
b	0.23729	0.15763	0.32922
c	0.23398	0.17848	0.15326
d	0.22817	0.30508	0.24338
e	0.23026	0.01121	0.40352
a'	0.24943	0.16302	-0.16101
b'	0.24066	-0.21964	-0.13482
c'	0.24813	-0.03339	-0.23762
d'	0.22281	-0.15012	-0.23153
e'	0.23951	-0.18815	-0.22195
f	0.20964	-0.43792	0.25888
g'	0.23765	-0.18898	0.18471
i'	0.24652	0.18647	-0.05749
j'	0.20826	0.43406	-0.29114
k'	0.23840	0.15012	-0.31090
p'	0.23063	-0.35399	-0.01677
q'	0.24939	-0.02341	-0.13520
r'	0.25128	0.07814	-0.08961
Variance	83.4%	6.0%	4.6%

compare the shapes and avoid the effect produced by the difference in size (see Materials and Methods). The landmark bregma constitutes the point that distinguishes the different sagittal triangles of the crania. Figure 2 shows the scatter plot of bregma coordinates of a sample of domestic dog and wild dog skulls. Intermediate size dogs have been eliminated to emphasize the differences between large and small dogs. We can see the dispersion of points, that is, the variability of this sagittal plane triangle in the crania of domestic dogs when they are compared with a limited sample of several different genera of wild canids. Variability in the domestic dog is greater than variability within other canid species in this study.

This domestic dog variability is at least a variability characteristic of a typical genus taxon, if not greater, as some authors have remarked (McKeown, 1975; Wayne, 1986). The skulls of small dogs are relatively taller than the crania of large dogs or those of wild dogs. The facial angle bregma-prosthion-condyle in the small dogs is greater than in large dogs or wild canids. Large dogs, however, can have a skull as short as the shortest of wild dogs (see Figures 1 and 2). All small breeds as adults have a skull which is in general morphology "juvenile" (paedomorphic adults, Wayne, 1986). Figure 2 shows how one of the small dogs has a sagittal triangle practically identical to two juveniles (see uppermost three points in Figure 2.)

The PCA gives a more general view in cranium study. To avoid most of the differences of size between the canid's crania we do not include in this work PC1. PC1 is responsible for most of the variability in dogs, and it refers

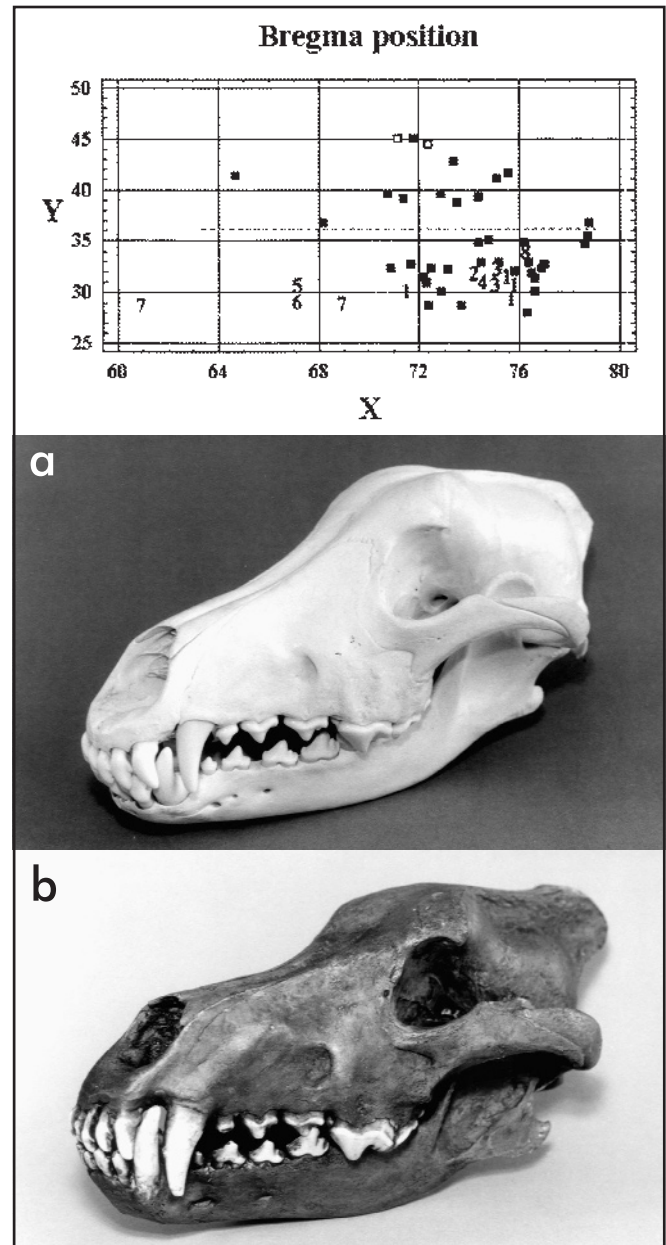


Figure 2. Scatter plot of relative bregma position. The dotted line separates the smaller skulls (above the line) from the larger skulls and those of other species of canids (below line). White squares correspond to juvenile domestic dogs. Solid squares correspond to adult domestic dogs. Numbers correspond to wild dogs. (1) Coyote (*Canis latrans*). (2) Black-Backed Jackal (*C. mesomelas*). (3) Gray-Wolf (*C. lupus*). (4) Red fox (*Vulpes vulpes*). (5) Raccoon dog (*Nyctereutes procyonoides*). (6) Swift fox (*V. velox*). (7) Gray fox (*Urocyon cinereoargenteus*). (8) Dire wolf, fossil (*Canis dirus*). X on this plot is a particular skull's relative bregma "x" and Y is its relative bregma "y". Each point represents one animal. Small dog skulls n=12. Large dog skulls n=24. Wild dog skulls n=13. a) *Canis lupus* (Gray Wolf) skull. b) *Canis dirus* (Dire Wolf) skull.

especially to size. PC2 entails 6 per cent of the variability and allows one to differentiate between domestic dogs and wild canids effectively, as show the Figure 3. The variables implicated in the differentiation between domestic dogs and wild dogs are the ones corresponding with the teeth (a, b, c, d, and e), the lateral face length (i'), basicranial length (k'), and the tympanic bulla (j'). Of these variables, the most prominent are d and j'.

PC3 consists of 4.6 per cent of the variability and allows to differentiate the small domestic dogs from other domestic dogs. The variables implicated in this discrimination are teeth (a, b, c, d, and e), as well as the maximum cranial width (g'), and least cranial width (f'). In PC2 as well as in PC3 the dental variable M²W (d) prominently figures in the discrimination between domestic dogs and wild dogs, and between large versus small domestic dogs. The research by Wayne (1986) also highlights the value M²W as a discriminant between domestic dogs and wild dogs. Each point on the scatter plot of Figure 3 has the PC2 and PC3 values of each particular domestic dog skull for its X and Y coordinates respectively. Figure 3 shows the morphologic spaces of domestic dogs and wild canids. It is obvious that the morphologic space of the domestic dog is quite large, compared to the space made from the sample of wild canids. It is also obvious that the small dog sample has a distinct morphologic space from the large dogs (PC3 axis in Figure 3).

The space occupied by the domestic dog does not include breeds of dogs with prominent disharmony of the jaw, evidenced by the lower jaw protrusion. An example of this type of prognathic dog has been situated in the graph of Figure 3 as a reference (point labeled "+"), and it belongs to boxer-like dog. In the research of Wayne (1986), we observe that the pattern of skull morphology among domestic dogs and wild dogs is not similar, and it overlaps only with the close wolf-like relatives, the gray wolf and the black-backed jackal.

The extensive variation of the shape observed in the domestic dog is not accompanied by a prominent genetic variation. Cases similar to this are frequent among domestic animals and plants (Darwin, 1868). And the same variation that occurs under domestication can occur in the natural environment, given the proper conditions (Johnston and Selander, 1964; Losos, 1997; Reznick et al., 1997). Under stressful conditions of domestication, the fox (*Vulpes vulpes*) increases its variability. In approximately 20 years time, the wild fox has altered its behavior becoming a domestic animal. It changed a few aspects of its morphology, undergoing hormonal changes. It even underwent changes of the karyotype (Belyaev, 1979). Parsons (1986) has suggested that these explosions of variability concentrate in periods of environmental stress.

Cases of environmental stress could have been frequent in nature on a worldwide scale after the Fall and again as a

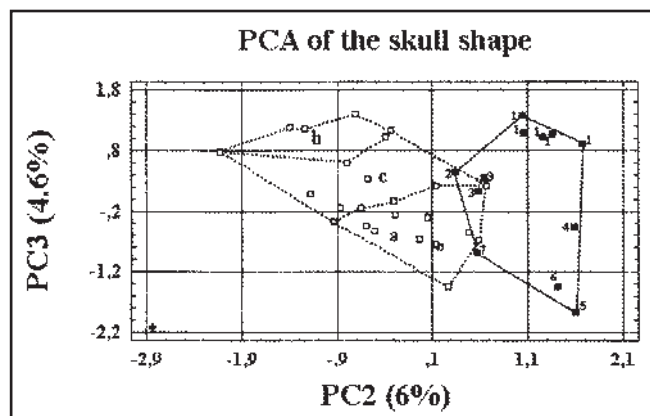


Figure 3. Polygons with dotted line correspond to domestic dog morphospace. Polygon "a" correspond to large skulls (n=15). Polygon "b" correspond to small skulls (n=7). Polygon "c" correspond to intermediate skulls (n=3). The point on this figure which represents a typical prognathic dog like the boxer is in left inferior corner, labeled with symbol +. Polygon with continuous line correspond to wild canids morphospace (n=12). See Figure 2 for numeration. It is obvious that the domestic dog has undergone great variation. But its morphospace has very little overlap with that of the wild canids species. Likewise small dogs and large dogs occupy different morphologic spaces. Each point represents one animal.

result of the Flood. But what is it that unleashes a process of variation under conditions of stress? Crossing-over (i.e., genetic recombination) is more frequent and mutations are more common under stress. Mobile genetic elements increase their mobility, passing from one place to another in the genome which produces alterations of genetic function (Belyaev and Borodin, 1982; Parsons, 1986). Molecular details of these processes have been seen in recent investigations. Heat-shock proteins are produced under high temperatures stress conditions. One of these protein (Hsp90) under normal conditions involving no stress, masked certain genetic determinants in *Drosophila*. When Hsp90 was altered, under stress conditions, the hidden genetic variation is expressed and continued to be expressed even when Hsp90 was restored to its normal state. Morphological alterations depended only on the genetic background.

To demonstrate that stress played an important role in the diversification of baramins after the Fall and after the Flood would be more difficult. Currently, however, there is a theoretical possibility of checking this. Under environmental stress, a fluctuating asymmetry is produced, that is, an alteration of the organismal morphological symmetry produced by a developmental instability (Parsons, 1992). Study of fluctuating asymmetry can reveal whether or not stress was a cause for the increase in variability in living beings after the Fall and after the Flood.

The great number of fossil specimens required to make this research possible, however, would present a problem.

Also it is possible that the Creator may have manipulated and enriched the genetic pool of mankind, animals, and plants after the Flood (Lammerts and Howe, 1974; Lammerts, 1983). An exceptionally favorable situation for change must have also occurred after the Flood, at which time the Earth was being completely repopulated (Woodmorappe, 1996; Brand, 1998). In that environment, the potential for variation in the species had the right opportunity to be manifested and life would have undergone diversification in a great measure. But even this post-Flood enhanced variation would have been within the limits imposed by the biological laws of Creation.

It should not astound us that human beings would have also varied under those post-Flood conditions. Ethnic groups like the Neanderthal, different from any present ethnic groups, could have emerged at the end of the Flood. Or perhaps it was modern man who differentiated from Neanderthal. Something similar could have happened with *H. erectus*. It also is possible that the differences were the result of different longevity among those ethnic groups and present man (Cuozzo, 1998). The craniodental variability of metric traits within the group that includes *H. erectus*, fossil *H. sapiens*, and *H. sapiens sapiens* (present) is not greater than that found in the domestic dog (García-Pozuelo-Ramos, 1998; 1999). Concerning variation of the craneodental shape in fossil humans, it is very difficult to study because the remains are quite scarce and fragmentary. Yet, it is possible that *H. erectus*, fossil *H. sapiens*, and *H. sapiens sapiens* form part of a common morpho-space characteristic of the holobaramin to which they belong. They may all be the post-Flood descendants of the Biblical Adam and Eve.

Conclusion

Humans have modified the genetics and hence the morpho-space of dogs by selective breeding for centuries. Thus it is obvious that each kind (like the dog kind) has a tremendous potential for variation, a potential which is seldom expressed so completely as it has been in dogs. Perhaps after the Biblical Flood, human beings, migrating to different localities, were forced into such diversified nascent habitats that the original *Homo sapiens* rapidly underwent enough variation to yield modern man and the fossil men including *H. erectus* and fossil *H. sapiens* as direct descendants of Noah and his sons. It is also possible that the Creator exercised some direct genetic manipulation when people were migrating into the post-Flood world.

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Book Review

Quest for Truth: Scientific Progress and Religious Beliefs by Mano Singham
Phi Delta Kappa Education Foundation, Bloomington, IN. 2000, 184 pp., \$22

Mano Singham is a professor of nuclear physics at Case Western Reserve University in Cleveland. I first became aware of Prof. Singham through his recent thought-provoking article, *The Science and Religion Wars* (2000). In *Quest for Truth*, Dr. Singham expands on the subject introduced in his *Kappan* article. He also delves fully into the realm of the philosophy of science. His insights are intriguing and in places difficult to understand. But the book is nevertheless an excellent read for those interested in the overlap between science and religion.

Prof. Singham starts out by describing four models of “creationism”:

1. *Creation science*, the belief that “the universe, life, humans, and other major species were created more or less whole by a divine Creator within the last ten thousand years or so” (p. 9).
2. *Gap theory*, in which the “creation process could have involved multiple cataclysms and creations and is flexible enough to accommodate most geological evidence” (p. 9). In other words, the universe is old and God intervened only at specific critical times in history.
3. *Day-age model*, in which the “six ‘days’ of creation in the Genesis story are interpreted metaphorically as representing long but indeterminate periods of time. . .” (p. 10).
4. *Intelligent design*, in which proponents “infer that some form of divine guidance (a Creator) had to be present

and actively involved . . . to explain the appearance of life in all its present forms. . .” (p. 11).

One may quibble a bit with Singham’s terminology; for example, intelligent design proponents don’t normally refer to their position as creationist. However, it is clear from the book that Dr. Singham has studied creation positions in detail and knows the basic tenets.

Singham accurately defines what he calls the creationist point of view: “If there is one common thread that all creationists share, it is that the world as we know it now is too complex and subtle to have come about without the active and repeated intervention of an external agent or a diety, acting outside the laws of science” (p. 11).

Singham goes on to contrast this with the naturalist point of view: “The scientific establishment, conversely, starts with the assumption that all natural phenomena should be explainable by natural [material, physical] laws that can be discovered using the methods of science” (p. 13). Since supernatural miracles “have no place in this framework” (p. 13), the creationist and naturalist worldviews are inevitably in conflict. (It may be noted that many scientists do not support this definition, but Singham is certainly correct that the science *establishment* adopts a naturalistic posture.)

Prof. Singham laments the fact that “there seems to be very little attempt by any of the protagonists in the science-religion wars to really understand what the other groups are saying” (p. 31). Instead, both sides typically use vitriolic

tactics to try to win the public to their side. This is most unfortunate, according to Singham, since “the issues raised are deeply interesting and have profound implications. . .” (p. 31).

One might wonder where Prof. Singham stands in this debate. He is, first of all, a practicing scientist who fully supports the naturalistic viewpoint. Dr. Singham says he is an atheist (although *agnostic* might be a better description, since he seems open to the possibility of a spiritual realm). Despite his naturalistic worldview, Prof. Singham is refreshingly open to resolving the conflict between science and religion. He genuinely understands that the creationist point of view has some merit, and he hopes that a peaceful resolution of the science-religion wars is possible.

At the end of the book Singham tries to suggest an approach that might help to ease the conflict. His answer is less than satisfying (to me at least), but nevertheless his views are worthy of consideration. A basic premise of Singham’s book is that “scientific progress is not necessarily leading us toward the truth” (p. 167). In other words, as we gain knowledge about the universe, we also uncover more questions that we don’t know the answers to. This being the case, Singham says there will always be room for religious beliefs, since science can never reach the point where everything is known. There will always be a role for both science and religion, and thus these two ways of knowing should be able to coexist.

A far better approach to ending the conflict, many of us believe, would simply be to return to a *traditional* definition of science. In this, scientists would be allowed to pursue *all logical* explanations for phenomena in nature, not just *naturalistic* ones. (John Calvert and William Harris have given a detailed description of this proposal (www.intelligentdesignnetwork.org/endingwar.htm).

Finally, it may be useful to point out a few areas where those from a creation/design perspective might disagree with Prof. Singham. First, he misunderstands the intelligent design position when he states that design proponents “adopt the strategy of focusing their energies on finding flaws in the case for evolution. . .” (p. 33). In fact, what ID tries to do is look *objectively* at the scientific evidence to determine which features in living things may be designed by some form of intelligence. A primary function of ID theory is to make design *inferences* when these are warranted. One looks in nature for *specified complexity* (William Dembski’s term) or *irreducible complexity* (Michael Behe’s term). Finding flaws in evolution may be part of the process, but it is not a primary goal.

Second, Prof. Singham fails to make a key distinction between *empirical* (experimental) and *historical* sciences. He does state that certain theories (including Darwinian evolution and Big Bang cosmology) are “explanations of unique historical events that cannot be replicated” (p. 76). Singham then goes on to say, however, that “I will use the

term *experiment* to denote both repeatable, controllable, laboratory-type experiments and observations of the type involved in cosmology [history of the universe] and natural selection [Darwinian evolution]” (p. 76). This implies that (in Singham’s mind) there is no distinct difference between experimental sciences (like chemistry and physics) and historical sciences (like cosmology, design and evolution).

While the naturalistic point of view seems valid for use with experimental sciences, the use of the naturalistic assumption in historical sciences detracts from objectivity. Since historical sciences cannot be falsified by planned experiments, the only way to test theories like Darwinian evolution is to compare them with the alternatives. The use of naturalism to exclude design theory from consideration is, in effect, not good practice of the scientific method. If creation/design proponents at times search for flaws in evolution, they are simply comparing their theory with the naturalistic alternative and this is good science.

Third, Prof. Singham rejects the idea of an absolute truth. Our knowledge base is constantly growing, but Singham believes that this new knowledge is “not necessarily leading us toward the truth...” (p. 167). Singham apparently subscribes to the postmodern viewpoint that there is no such thing as objective truth. At the same time, Singham acknowledges that a strength of religion is that it provides a core of values that are believed to represent eternal truth. So perhaps at the core of the science-religion wars is a search for truth. Singham believes scientific progress will not lead to truth, while those who put their faith in God the Creator believe that truth has already been found and revealed to man. Since science is a part of God’s universe, there can be no real conflict between true science and religion.

In short, the real war between science and religion is not (as Prof. Singham would suppose) a fight between evolution/Darwinism and creation/design. The real debate is over the definition of science. Is science the search for *natural* explanations for phenomena in the universe (*i.e.*, explanations that involve only natural law and chance), or is it the search for *logical* explanations (which may include natural law, chance, and design)? As long as the science establishment continues to exclude the possibility of intentional design in nature, I predict the war will continue.

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Theological Implications of Deep Time

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Abstract

The age of the earth and universe beyond continues to generate lively discussion, including among theists. The recent creation view is often held up as an object of ridicule and caricature. However,

those who promote a vast time scale, sometimes called deep time, must address several serious theological issues. Six implications of deep time are discussed here.

Introduction

One tenet of the Creation Research Society is that the earth and universe beyond are thousands of years old rather than billions. Some have wondered how strongly a recent creation should be defended. Are we unnecessarily *marginalizing* ourselves? After all, the age issue seldom arises in the current Intelligent Design Movement. Furthermore, most church denominations, Christian colleges, and parachurch ministries readily accept multi-billions of years of history, sometimes called “deep time.” However, ideas have consequences, and this is especially true for the age issue.

The following section reviews six implications of deep time as promoted in *progressive* or *old-earth* creation. This view of Genesis does not accept macroscopic evolution. Instead, at various stages of history, God is said to have stepped in and created various kinds of life. Progressive creation also accepts a literal Adam and Eve, though at a very late stage of history. In this view the earth and solar system are thought to be about 4.6 billion years old in agreement with naturalistic or secular geology. Furthermore, a big bang origin for the universe is assumed to have occurred between 8-16 billion years ago (12 billion years will be used in this paper). It is my belief that many progressive creationists have not thought through the serious consequences of the deep time assumption.

Six Implications

1. Mankind is limited to the last 0.001 percent of universe history.

This small percent derives from the popular assumption of a big bang occurring 12 billion years ago, and modern man

existing *only* during the last 120,000 years or so. To illustrate this incredibly small percentage, let a person’s outstretched arms represent 12 billion years of history. Then one stroke of a fingernail file across a fingernail would completely eliminate the era of mankind.

The Creator certainly *could* have spread out prehuman physical history in this way. However, scripture indicates otherwise. Jesus refers to our first parents in Mark 10:6, “But at the beginning of creation God made them male and female.” See also the similar statement in Matthew 19:4. In both cases the word *beginning* is αρχη (archē). The meaning is from the very beginning, the absolute start of all things (Bauer, p.112). The origin of mankind clearly fits a literal, supernatural creation week. Those who accept deep time necessarily place humanity as a tag-end afterthought to history.

2. Ninety-nine percent of animal and plant life was extinct long before mankind arrived on the earth.

For example, geologists describe the Permian extinction 245 million years ago when 95 percent of earth’s life some-

Table I. Summary list of assumed geologic mass extinction events (MYA: millions of years ago).

Extinction Event	MYA	Comment
Ordovician	440	85% of all species lost
Devonian	365	75% of species lost, especially marine animals
Permian	250	90-95% species loss
Triassic	208	75% species loss
Cretaceous	65	80% species loss, including dinosaurs and flying/marine reptiles
Today	0	An assumed current major species loss due to habitat destruction

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how was wiped out. Six assumed major historical mass extinction events are listed in Table I. Catastrophic collisions between the earth and extraterrestrial objects are increasingly offered as explanations for these extinctions. The picture presented is that the Creator experimented with animal and plant life over a vast prehuman time scale. For example the entire dinosaur world, extending over 200 million years, was in a *Land Before [human] Time*. Now the Creator surely *could* have organized a long prehistory of animal life and death in this way. However, scriptural evidence is completely lacking. In fact, Genesis 2:20 explains that Adam gave names to “all the livestock, the birds of the air and all the beasts of the field.” One wonders how this was possible if nearly all the animals were already extinct by the time Adam appeared on earth.

3. The Genesis Flood was a local event that left little or no physical evidence.

This implication necessarily follows because the earth’s geologic strata are interpreted as chapters of deep time rather than Flood deposits. Progressive creationist Hugh Ross is consistent in his conclusion that “No viable scientific evidence has ever been found for a recent global Flood” (Ross, p.157). However, Ross ignores 40 years of Flood research by the Creation Research Society. In fact, the CRS has published nearly 5,000 pages of material favoring a global Flood. This evidence may be largely ignored today but it is no less significant. Furthermore, Genesis 7:23 clearly describes a worldwide Flood, “Every living thing on the face of the earth was wiped out; men and animals and the creatures that move along the ground and the birds of the air were wiped from the earth. Only Noah was left, and those with him in the ark.”

4. The Bible does not mean quite what it says.

With deep time the days of Genesis One must be interpreted as non-literal or at least non-sequential. However, Exodus 20:11 teaches that our calendar week is modeled directly upon the creation week. After all, there is no known object in astronomy with a seven-day period from which the week could have originated independent of creation. Certainly the word *day* has multiple meanings in scripture, both 12 hours and 24 hours in Genesis 1:5, and an entire week in Genesis 2:4 (KJV). However, every word in any language similarly can assume multiple meanings. Try this with any word that comes to mind. The context must determine word meaning, and the Genesis creation account most clearly describes literal days.

Sometimes 2 Peter 3:8 is used to promote the idea of non-literal creation days. The verse states that “With the Lord a day is like a thousand years, and a thousand years are like a day.” But this verse, a quote from Psalm 90:4,

does not refer to the creation week. Instead it teaches that God is above time and sees all of history simultaneously. The verse also fails to satisfy the long age view. If the assumed 12 billion years of universe age are divided into six long creation days, each day must then be two billion years old. This is certainly an extreme stretch of both Exodus 20:11 and 2 Peter 3:8.

5. Animal death, disease, pain, and predation existed long before the curse of Genesis 3.

However, Romans 5:12 teaches that death first began at the time of the Fall. There is the counter argument that the death of Romans 5:12 was limited to spiritual death of humanity only and did not apply to animals. However this argument is weak and unconvincing (DeYoung, 1997). After all, the very first biblical reference to death is Genesis 3:21, when the Lord made garments for Adam and Eve from animal hide. This particular implication concerning death may well be the strongest and most fatal blow to the deep time concept. There are enormous theological consequences to an assumed history of death and imperfection before Adam.

6. End-time events will likewise require billions of years for their completion.

This implication follows from a consistent application of the big bang theory, an integral component of deep time. In the big bang theory, light from distant galaxies requires billions of years to reach the earth. What will then happen when God someday forms a new heavens and earth? Old light still in transit, giving a picture of the former heavens, must continue to strike the earth for billions of years. But this idea contradicts 2 Peter 3:10 which describes the heavens as disappearing with a mighty roar. The problem here is the direct connection of deep space with deep time, required by the big bang theory. In the creation view, without the constraint of big bang expansion, time and distance are entirely separate quantities. Space is indeed vast in size but not necessarily great in age. And when God reprograms the cosmos, the results will be obvious to earth immediately, just as the sun, moon, and stars were seen immediately upon their creation on the fourth day (Genesis 1:16).

Conclusion

An acceptance of deep time into one’s worldview reveals two basic errors. First, the authority of current *science* is *overestimated*. The existence of deep time is taken as absolute proven fact, but this is not the case. The deep time concept is simply imbedded in big bang and evolutionary

theories as a presupposition. Thousands of scientists and millions of others instead prefer a recent creation. The same data is available to all, whether radioisotope dating results or stellar distances. The age interpretation of this data varies greatly.

A second basic error of deep time acceptance is that the *Bible* is *underestimated*. Biblical truth is placed at a lower level of authority than current science. But our scientific understanding continues to change while the Bible does not change. This inspired book truly has stood the test of time.

Those who have bought wholesale into an ancient earth and cosmos are respectfully asked to consider the implications. The belief in deep time is an unnecessary complication to one's worldview. In another sense, however, it is not nearly long enough. The current physical creation is a

brief interlude, thousands of years in length, between eternity past and future. Therein lies the true concept of *deep time*.

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Book Review

Handbook: Creation, the Flood and Historical Dating by John G. Read
Apocalypse Press.* 2000, 206 pages, \$12.95

Read's book (not to be confused with CRSQ geology editor John K. Reed) is ambitious, dealing with geology, radiometric dating, astronomy, geophysics, biblical chronology, and other subjects. His geology presentation (pp. 23–32) deals with the supposed Keystone overthrust, near Las Vegas, where evidence for overthrusting is absent. He contrasts that with Amargosa overthrust, Death Valley (CA), where there is evidence for overthrusting, including a buckling of the overthrust section (from pressure when the thrusting occurred), and broken, fragmented breccia on the surface where thrusting occurred. Pictures illustrate the author's claims.

The radiometric dating chapter (pp. 33–60) was valuable for an overview of the history of the subject, explaining how calculated age discrepancies for terrestrial igneous samples were blamed on contamination. That led to the search for lunar rocks that were thought to be uncontaminated. However, the lunar U-Th-Pb and K-Ar dates did not match those determined by the Rb-Sr method (p. 52). Therefore old-earth scientists theorized that Rb-Sr isochron dating was the most accurate. However, Read (pp. 48–50) summarized Gill's (1996) work pointing out that Rb-Sr isochron dating uses a faulty mathematical mode.

Read believes that a planet formerly existing between Mars and Jupiter was destroyed, resulting in the asteroid belt currently located there. He believes (p. 127) that the Bible uses the name "Daystar" for that planet. On p. 169 he suggests it was a geographical separation of the earth,

with rapid geophysical changes that occurred when the earth was divided in the days of Peleg (Gen. 10:25). However, Old Testament scholar Dave Fouts (1998) argues that a worldwide cataclysmic continental separation when Peleg was born is not suggested by the context.

Read's Old Testament chronology presents some interesting data, though the reader may also want to consult McFall (1991) or Thiele (1983) for other evangelical perspectives. On p. 107 he suggests that the biblical Assyrian king Pul (2 Ki. 15:17–19) was *not* another name for Tiglath-pileser III, an idea which numerous historians would disagree with (the present reviewer among them). He acknowledges Tiglath-pileser III had the name Pul, though he suggests the biblical Pul was another otherwise unknown person with the same name. He thinks (p. 105) the solar eclipse during the reign of Assyrian king Assur-dan III was in 809 BC instead of the very widely accepted 763 mentioned by the Assyrian eponym canon. Because of this, his chronology will not permit the Assyrian synchronism's for Shalmaneser III's sixth and eighteenth years with the Israelite Kings Ahab during 853 BC and Jehu in 841 (contrary to Thiele (1983), McFall (1991) and many others). Read must postulate the very unlikely occurrence of 46 missing eponyms from the Assyrian calendar between his revised eclipse date for Assur-dan during 809 BC [continued on page 52].

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Reinventing Stratigraphy at the Palo Duro Basin

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Abstract

Instead of futilely squeezing time from the uniformitarian geologic column, creationists should allow biblical presuppositions about natural history to revolutionize stratigraphy. This type of approach is tested at the Palo Duro Basin, a cratonic sedimentary basin located in the Texas Panhandle. An assessment of the basin fill allows revision of strata out of the uniformitarian framework and into genetic units

that reflect depositional and tectonic episodes. These in turn can be interpreted within the framework of the Genesis Flood, and the genetic units assigned a tentative position along a geologic energy curve as a basis for regional correlation based upon Flood stage rather than time. In this framework, the Palo Duro Basin's history provides several clues to the nature of the Flood in central North America.

Introduction

How should creationists pursue the interpretation of the rock record? Were Whitcomb and Morris (1961) right in calling for a reinterpretation of empirical data, or do we merely need to shrink the timescale of the uniformitarian geologic column? If we reinterpret, how do we draw the line between the purely descriptive, proper genetic, and improper genetic propositions? After all, descriptive and genetic aspects of forensic writing often intertwine. And layers of often unrecognized assumptions infiltrate even apparently descriptive texts. What do we reject and what do we keep? These are all difficult questions, and although many creationists have offered advice on how to proceed, no consensus of principles and methods for creationist stratigraphy exists. Our difficulties begin to be resolved by recognizing that natural history is a subset of history, not science (Reed, 2001). It requires an extrascientific framework that recognizes hard boundaries of biblical truth, but does not slight forensic aspects. Klevberg (1999; 2000) discussed distinctions between scientific and nonscientific facets of stratigraphy. What about the uniformitarian geologic column? Can it be applied as long as the time is properly condensed?

The rapidity of the Flood event seems to preclude even a condensed time-stratigraphic interpretation (Reed et al., 1996; Froede and Reed; 1999; Reed, 2000). Any regional topographic variation relative to "mean Flood level" (MFL) at any given time would result in depositional systems created by similar Flood environments being radically time transgressive. In other words, as the Flood moved across a region, its final vertical signature of

rock units might be similar over the entire area, but the individual units in the vertical sequence might be strongly diachronous. For example, if a hypothetical vertical sequence consisted of units A, B, C, and D, the arrangement of A-B-C-D might be present over a wide area, but units A and C may have been deposited at the same time. Given this potential, *time* should not serve as the primary correlation key to the rock record as applied in the uniformitarian column. In place of time, Reed et al. (1996) suggested geologic energy as a new means of stratigraphic correlation. Although drawbacks exist, primarily in the difficulties of quantifying the concept, it has seemed applicable where attempted (Lalomov and Tabolitch, 1999; Reed, 2000). Other means are possible and should be developed and tested by creationists.

If geologic energy is a way of ordering stratigraphic units, then its utility must be demonstrated in a wide variety of settings. The Palo Duro Basin provides a location for testing this concept. It is a relatively undeformed cratonic basin that has been extensively explored for oil and gas (with little success): more than 1,000 exploration wells have been drilled in the basin (Ruppel, 1985) and many thousands more provide regional context in the surrounding area. It was investigated in the late 1970s by the Texas Bureau of Economic Geology as a potential storage site for high-level radioactive waste for the United States Department of Energy. Abundant data and the skilled efforts of many geologists combined to supply a descriptive understanding of the basin and its sedimentary fill (Johns, 1989; Nativ, 1988; Ruppel, 1985; Dutton et al., 1982; Dutton, 1980; Handford and Fredericks, 1980).

An advantage of this basin is its strategic location between the Texas Permian Basin and the southern midcon-

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inent basins along the northern boundary of the Amarillo-Wichita Uplift (Johnson et al., 1989). Any interpretive success in the Palo Duro may pave the way for extrapolation both north and south. Such extrapolation might prove interesting indeed, for though the Palo Duro has proven relatively barren of hydrocarbons, the Anadarko and Permian Basins are prolific producers. The Permian Basin alone has produced over 25 billion barrels of oil and over 75 trillion cubic feet of gas (Tyler and Banta, 1989).

Challenges for Creationist Stratigraphy

Natural history includes the interpretation of forensic evidence within an historical framework. Reed (2001) has explored the role of presuppositions and some implications of applying biblical assumptions to natural history. Since the bulk of this forensic evidence of the earth's past is found in the rock record, the science of geology (not to be confused with uniformitarian historical geology) is particularly applicable. But the nonscientific framework cannot be ignored: in spite of common confusion, the rock record and the uniformitarian geologic column are not one and the same. Therefore, natural history within the Biblical Worldview requires replacing that naturalistic construct with a framework built on other assumptions.

The rock record has been interpolated worldwide by the correlation of rock units. Stratigraphy is the discipline which is concerned with how rock units are correlated. Sometimes the distance over which units are to be correlated is the width of an outcrop, sometimes the width of a basin, sometimes the width of a continent. As the scale increases, so usually does the uncertainty. It is helpful to assess this uncertainty in any evaluation of the geologic column. Physical correlation of outcrops provides the greatest degree of confidence. Indirect physical correlation of rock units and their bounding surfaces can be done by subsurface well logs and reflection seismic techniques, and the degree of certainty can usually be assessed from the data. When physical correlation becomes impossible, then other methods are applied: correlation by lithology, bounding surfaces (e.g., Sloss, 1963), and fossil content.

Correlation across physical discontinuity by lithologic similarity and fossil content engenders less confidence. The impossibility of biological evolution severely undermines biostratigraphy (although fauna may be useful in defining depositional conditions), and the work of Berthault (1994) requires that care be applied even in deriving timing and environment from lithostratigraphic correlation. These problems raise two questions for creationists:

1. If conventional *methods* are rendered inappropriate by faulty presuppositions, what methods are appropriate for stratigraphic analysis? and

2. If conventional *interpretation* is also suspect because of faulty presuppositions, what part of the current body of knowledge requires correction?

Biblical natural history offers some constraints (Reed and Froede, 1997). Assumptions of deep time, uniformitarianism, and the role of present-day depositional environments to interpret the past all need to be rejected. How should we proceed? The first step applied here is to convert the time-stratigraphic framework into an event-stratigraphic framework, and then interpret those events inside the boundaries set by the Bible. Careful use of current descriptions is encouraged, but interpretation must follow new presuppositions. To what extent are description and interpretation separable? Description at the most fundamental level includes geometry and composition. Those aspects of existing works are often of high quality, even when interpretive conclusions are not.

Beyond the scope of clear correlation by outcrop, log, or seismic line, creationists must reject biostratigraphy and focus on parameters deduced from the fact of a global Flood: environment, tectonics, and relative sea level (i.e., Flood water level). In addition to deriving explanations of the lateral relationships of geometry and composition, creationists must also address vertical relationships with more care than uniformitarians. The timing of the Flood event forces us to explain vertical relationships that uniformitarians have been able to ignore by an appeal to missing section and supposed large temporal gaps. When we encounter vertical changes in lithology or geometry, we cannot so easily escape the implication that our models are deficient when they do not explain the transition. How will this approach work in the Palo Duro Basin?

Description of the Palo Duro Basin

The Palo Duro Basin is a part of a complex of basins and arches in the Texas Panhandle and southern midcontinent (Figure 1). Prior to its formation during Pennsylvanian¹ sedimentation, it was part of the regional lower Paleozoic Oklahoma Basin (Johnson et al., 1989). It occupies approximately 19,000 mi² (Handford and Fredericks, 1980) and is relatively shallow; usually less than 10,000 ft. from land surface to Precambrian basement (Dutton, 1980). To the south, it is bounded by the Matador Uplift, which separates it from the much larger and deeper Permian Basin. To the north, the Amarillo-Wichita Uplift separates it from the Anadarko Basin, and to the northwest over a low in the Bravo Dome lies the Dalhart Basin. Low structural features separate the basin east and west from the Hollis/Hardeman and the

¹I use the local nomenclature of the geologic column for ease of reference to existing literature.

Tucumcari Basins, respectively. The Dalhart Basin and Hollis/Hardeman Basin are commonly included in discussions of the Palo Duro Basin (e.g., Dutton et al., 1982).

The dominant tectonic feature of the Texas Panhandle is the Amarillo-Wichita Uplift. However, during its early history this feature was a deep trough, the Southern Oklahoma Aulocogen (Gilbert, 1983), initially infilled by up to 20,000 ft. of extrusive and intrusive silicic igneous rocks (Johnson et al., 1989; Hogan and Gilbert, 1997). Continued tectonic downwarping led to the development of a deep trough (see Figure 3 of Johnson et al., 1989). Rapid reverse motion was initiated during early Pennsylvanian (Morrow) sedimentation that led to the dramatic elevation of the Amarillo-Wichita Uplift along reverse faults with up to 40,000 ft. of throw. Reverse faulting is dated to a short interval of the lower Pennsylvanian system, although some motion continued until the end of Pennsylvanian sedimentation. Sediment distribution patterns strongly suggest that this uplift was regional: surrounding arches and basins appear to have been activated during this same interval (Johnson et al., 1989). To the south, the Matador Arch was uplifted at the same time in a series of discontinuous east-west fault blocks which form the southern boundary of the Palo Duro Basin.

The Palo Duro Basin contains predominantly marine carbonate and evaporite rocks with locally abundant terrestrial clastics, including thick deposits of "granite wash." Stratigraphically, the Palo Duro Basin fill ranges from Precambrian to recent on the uniformitarian column (Figure 2), but the bulk is Pennsylvanian and Permian. I will eschew the time-stratigraphic framework of the geologic column and introduce an alternate interpretation explicitly compatible with biblical natural history.

Escape from Deep Time:

Event Stratigraphy in the Palo Duro Basin

The fill of the Palo Duro Basin can be divided into seven genetic units—combinations of strata that reflect similar

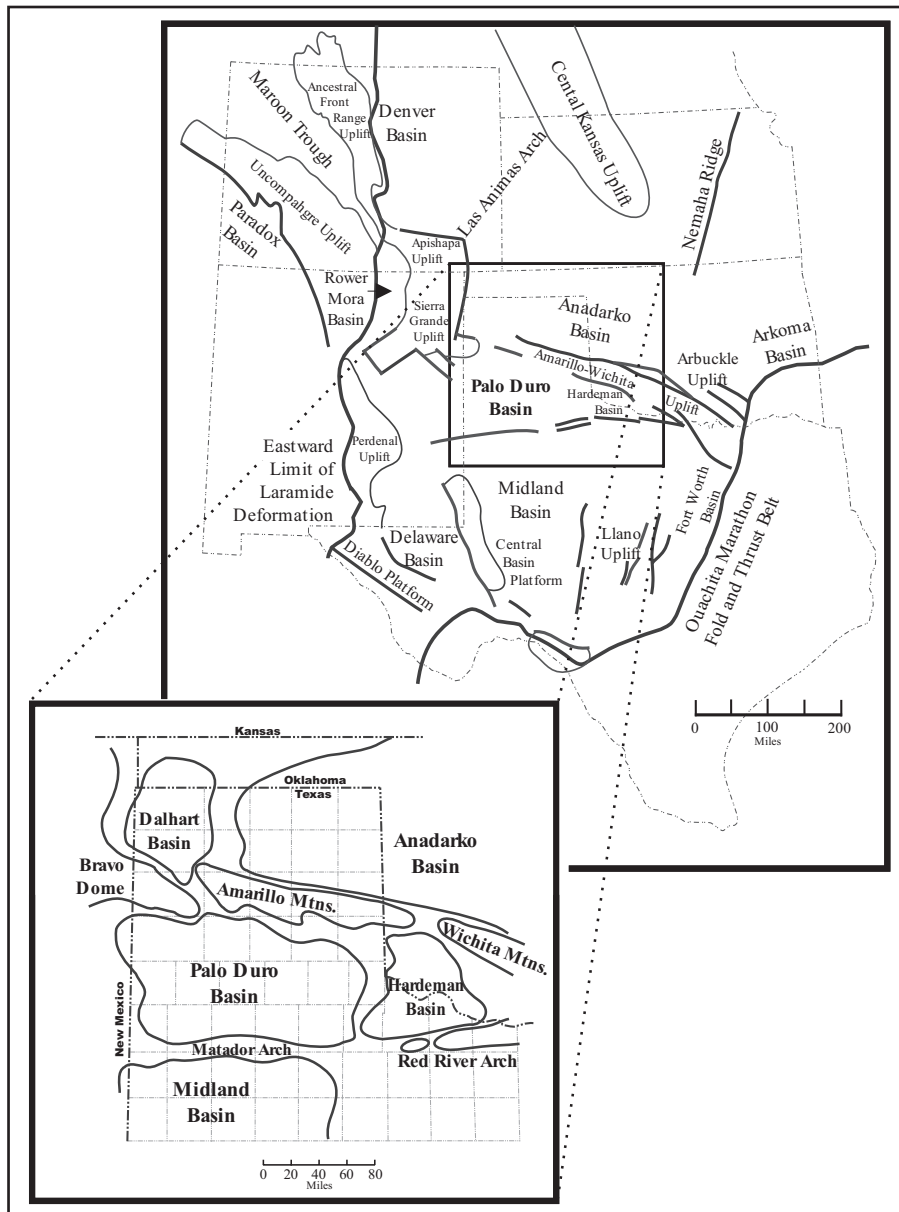


Figure 1. Location and regional tectonic setting of the Palo Duro Basin. After Johnson et al., 1989; Dutton et al., 1982, and Ruppel, 1985.

environmental or event settings with consideration given to intervening major physical unconformities (Figure 2). I derived these units from the description of the range of properties of the rock units, including lithology, geometry, and the nature of their bounding surfaces. Immediately noticeable is the relative thickness of the units (Figure 3). Unit 1 is thick, but is composed of igneous rock. Units 2 and 3 are relatively thin marine strata, while Units 4 and 5 are relatively thick marine strata. The thickness of these units can be related to two different factors: Unit 4 to the tectonic history of the basin, and Unit 5 to the expected increase in thickness of units deposited during Flood regression as compared to those deposited during its advance across the continent and its increase to highstand. Predom-

System	Series	Group/ Formation	Lithology/Environment	Genetic Unit
Quaternary		Undiff.	Terrestrial clastics deposited in fluvial, eolian, and lacustrine environments.	Unit 7
Tertiary	Mio./Plio.	Ogallala		
Cretaceous		Undiff.		
Jurassic				Unit 6
Triassic	Upper	Dockum	Nonmarine red beds.	5b
Permian	Ochoa	See Figure 7	Interfingering, alternating beds of carbonate (mostly dolomite), salt, anhydrite, and red beds of mudstone, siltstone, and sandstone.	5a
	Guadalupe			Unit 5
	Leonard			
	Wolfcamp	Undiff.		Unit 4
Pennsylvanian	Virgil	Cisco	Deltaic sandstones and shales, shallow marine carbonates, and deep basin shale and limestone. Fan deltas of granite wash in lower section.	
	Missouri	Canyon		
	Desmoines	Strawn		
	Atoka	Bend		
	Morrow			
Mississippian	Chester	Undiff.	Shallow marine carbonates with interbedded sandstone, shale	Unit 3
	Meramec			
	Osage			
	Kinderhook			Unit 2
Devonian				
Silurian				
Ordovician	Cincinnati			
	Champlain			
	Canada	Ellenburger	Shallow marine dolomite	2b
Cambrian			Basal lag sandstone.	2a
			Silicic igneous rocks, small mafic portion	Unit 1
Precambrian				

Figure 2. Stratigraphic column of the Palo Duro Basin showing the relationship between time-stratigraphic units classified by uniformitarian researchers and the genetic units proposed in this paper (modified from Dutton et al., 1982, Ruppel, 1985, and Gustavson, 1980). Gray areas represent absent sections.

inantly nonmarine sediments of Units 5b, 6, and 7 reflect the waning stages of the Flood. These genetic units are presented outside of their time-stratigraphic classification. That information is available in the references cited in the following section.

Unit 1

The first unit does not consist of any sedimentary rocks, but is a part of the basin's development. The basement complex beneath the Palo Duro Basin is a combination of several terranes. The Panhandle Rhyolite is a thick complex (3,821 ft. drilled in Potter County, Texas; up to 20,000 ft. modeled [Dutton et al., 1982; Johnson et al., 1989]; and up to ten kilometers in a seismically-imaged basin [Ewing, 1990]) with sparse interbedded sediments. The Amarillo Granite terrane is considered its intrusive analog, and the regional Western Granite-Rhyolite Province is located to the east and south of these panhandle units. Diabase and gabbro of the Swisher Terrane (Muehlberger et al., 1967) appear to overlie the rhyolite. Granite in the subsurface is present as both batholiths and sheets (Hogan and Gilbert, 1997). Uniformitarians date much of the local basement complex between 1400 and 1200 Ma, with another episode of tectonically associated igneous activity at the Amarillo-Wichita Uplift in the early Cambrian reported between 577 and 514 Ma (Hogan and Gilbert, 1997).

In addition to the pre-Flood basement, I believe that part of this igneous complex was formed during a significant tectonic event that marked the onset of downwarping of the Southern Oklahoma Aulocogen—a dramatic tectonic disruption of the crust on the north edge of what would become the Palo Duro Basin. I interpret this episode as the onset of the Genesis Flood. The abrupt nature and scale of the tectonic disruption and resulting igneous activity are correlative to the Midcontinent Rift System to the north and similar basement features across North America (see Figure 2 of Reed, 2000).

The Southern Oklahoma Aulocogen and the Midcontinent Rift System are similar in the scale and magnitude of tectonic and igneous activity. Both are regional linear to arcuate zones of extensional crustal disruption with severe downwarping and associated igneous

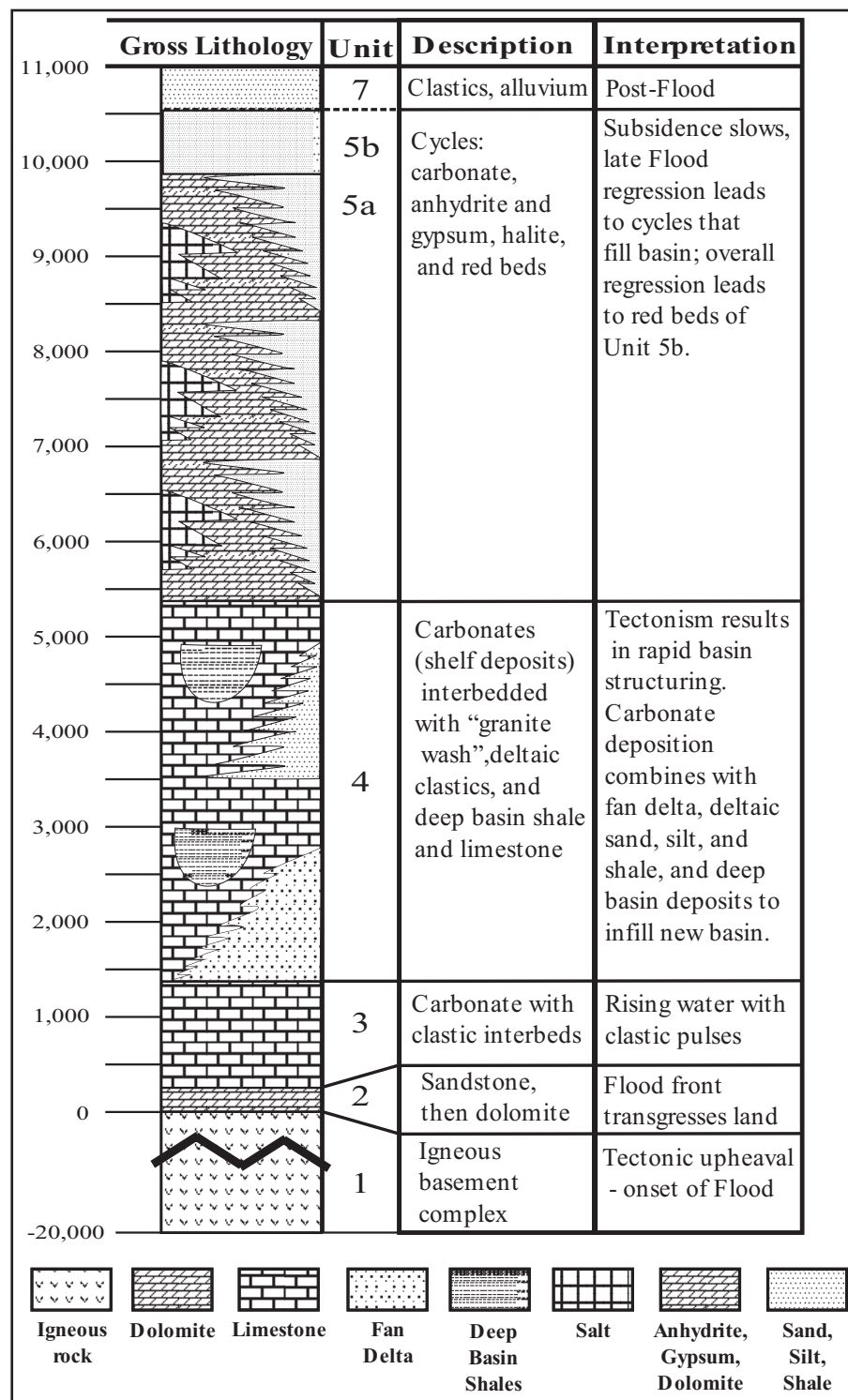


Figure 3. Relative thickness and gross lithology of genetic units. Brief description and interpretive summary shown in adjacent columns. The maximum sedimentary thickness was generated by deposition of Units 4 and 5. Note artificial shortening of Unit 1 section.

activity. Both experienced later inversion along early faults, forming sedimentary basins of great depth adjacent to uplifted blocks.

relative MFL.

The earliest sedimentary unit is sandstone, commonly dated as Cambrian and often correlated with the Hickory

Two distinctions between them are (1) the dominant silicic nature of the intrusive and extrusive rocks at the Southern Oklahoma Aulocogen, and (2) the absence of thick sections of non-marine sediments found in the Mid-continent Rift System basins. The difference in rock composition reflects a difference in magma composition, and that topic is well beyond the scope of this paper. The absence of non-marine clastic sediments at the Southern Oklahoma Aulocogen supports the thesis in Reed (2000) that the Flood transgressed the continent from south to north. The rapid inundation of the southern part of the continent prevented significant accumulations of non-marine sediments; those that were washed into the Flood front by runoff were probably reworked into the basal lag of Unit 2.

Unit 2

The second unit consists of the thin veneer of clastic sedimentary rocks that immediately overlie the igneous complex, and the Ellenburger Dolomite. These two lithologies are similar in their lateral extent and appear not to be separated by any significant unconformity. The quartz sandstone contains clasts of limestone and dolomite, suggesting marine conditions, but also appears to grade downward to the weathered basement, suggesting some degree of *in situ* breakup of the igneous rocks and limited transport of the resulting lithic fragments. This unit thickens significantly to the north, suggesting that much of the initial downwarping of the Southern Oklahoma Aulocogen was accomplished quickly, and the subsiding submarine trough was rapidly infilled by carbonates. Unit 2 is absent on the Texas Arch, which was a positive structure covered later by sediments of Unit 3. It may have been active early during the Flood, leading to thinning over it and subsequent ease of erosion during changing

or Reagan sandstones, the Riley Formation, or the younger Wilberns Formation (Ruppel, 1985). This unit rarely exceeds 50 ft. in thickness and is composed of rounded quartz sandstone, conglomerate, and gray and green shale. The thickest accumulations in the Palo Duro Basin (>200 ft.) coincide with a structural depression on the Texas Arch. The sandstone is the basal transgressive lag deposit of the earliest recorded transgression of the continent (Ruppel, 1985).

The Ordovician Ellenburger Dolomite (Barnes et al., 1959) is generally correlative to the Arbuckle Group farther north on the midcontinent (Johnson et al., 1989) and is a prolific oil producing horizon in southwest Texas (Tyler and Banta, 1989). The Ellenburger is widespread across west Texas and eastern New Mexico. It occurs over much of the eastern and western Palo Duro Basin; its local absence on the Texas Arch is attributed to later erosion (Ruppel, 1985) but may also have resulted from non-deposition on an existing high (Wright, 1979). Where present, it averages approximately 200 ft. in thickness, but reaches 1,200 ft. in the east and northeastern Palo Duro Basin in fault blocks against the Amarillo-Wichita Uplift and more than 2,000 ft. in the Anadarko Basin (Dutton et al., 1982). It is commonly gray to brown, but includes white, cream, yellow and pink, fine- to coarse-grained, rhombic to sucrosic dolomite. Shale, rounded quartz sandstone, pink to white chert, and pyrite are common. Glauconite is also common at the base and top of the unit. The upper unit is commonly brecciated with dolomite clasts, sand, and glauconite. The dolomite is considered diagenetic, but the precursor limestone was apparently predominantly massive. Relict sedimentary structures, where visible, include parallel, planar laminations and burrows. The Ellenburger is predominately dolomite in west Texas, but grades to limestone as it thickens in areas of central Texas and Oklahoma (Johnson et al., 1989).

I interpret Unit 2 as deposits resulting from the initial transgression of the Flood waters over the Palo Duro Basin region. Igneous rocks were strongly eroded by both pre-transgressive rain and then by the transgressive front of the Flood itself. The sandstone shows evidence of marine deposition. There do not appear to be any preserved non-marine clastic sediments as are seen farther north at the Midcontinent Rift System. Therefore, I believe that the marine waters of the Flood covered this area quickly, moving south to north across central North America.

As the water covered this area, carbonate deposition rapidly overcame clastic deposition. This could have resulted from (1) a decrease in clastic source material, (2) an interruption in clastic transport; or (3) a significant geochemical impetus toward carbonate precipitation, probably caused by heating and CO₂ degassing of the upwelling marine waters. Although all of these factors may have contributed to the carbonate buildup in the Palo Duro Basin,

the most singular is the third. In addition, the introduction of ions from early volcanic and associated igneous activity and the dissolution of pre-existing carbonates or other chemical rocks may have also driven carbonate precipitation. The presence of iron and silica minerals within the Ellenburger may have originated from volcanism associated with the onset of the Flood at the Southern Oklahoma Aulocogen and to the south, near the Marathon Basin (Ewing, 1990).

By reference to the uniformitarian geologic column, Middle and Upper Ordovician, Silurian and Devonian strata are absent from the Palo Duro Basin, as is the lowest Mississippian, or Kinderhookian, section (Figure 2). However, these units are thick and regionally pervasive to the south in the Permian Basin (up to 4500 ft., Wright, 1979) and to the north in the Anadarko Basin (up to 5,000 ft., Ruppel, 1985). These lower Paleozoic strata may be absent in the Palo Duro Basin by either non-deposition or later erosion (Dutton, 1980). The differences between the Palo Duro Basin and the Permian and Anadarko basins relative to the composition and presence of lower Paleozoic rocks suggests several possible explanations. The rapidly sinking Southern Oklahoma Aulocogen and basins to the south may have acted as clastic traps and kept the area around the Palo Duro Basin a carbonate province during the entire time. Or, as posited by uniformitarians, those sediments may have been deposited and later eroded. This question is an example of the need to carefully evaluate the vertical relationships between rock units and attempt alternate explanations. Such an investigation in this particular case is beyond the scope of this paper, requiring regional analysis.

Unit 3

Separated from the underlying Ellenburger by a physical unconformity surface is Unit 3. It comprises carbonates mixed with clastics that are classified as the Osage, Meramec, and Chester series of the Mississippian (Figure 2). Mississippian carbonates are present over much of the Texas Panhandle, reaching up to 900 ft. in the Palo Duro and up to 1,400 ft. in the Hollis/Hardeman Basin. Unit 3 pinches out to the northwest against the Transcontinental Arch, but increases up to 4,000 ft. in the Anadarko Basin (Ruppel, 1985).

Kinderhook sandstones are present in the Anadarko Basin, but basal clastics of Unit 3 in the Palo Duro Basin are shales, assigned to the Osage series (Ruppel, 1985). These rocks are widespread across the basin and range in thickness up to 300 ft., compared to 175 ft. in the Dalhart, and over 1,000 ft. in the Anadarko Basins. They include gray or brown argillaceous dolomite with chalky, dolomitic limestone and gray to green shale (Dutton et al., 1982). The dolomite content increases from east to west across the

Panhandle. Chert is ubiquitous, and pyrite, glauconite and sand are common. Wackestones and grainstones alternate and contain abundant skeletal debris from bryozoans and echinoderms (Ruppel, 1985). Breccia is present, but not common. Siliceous sponge spicules are also present in the dolomite.

Osage carbonates grade conformably upwards into Meramecian limestones, present across the Palo Duro Basin up to 300 ft. thick, and up to 1,500 ft. thick in the Anadarko. The top of Meramecian limestones is regionally recognized by SP (spontaneous potential) and resistivity changes on electric logs. Limestones are buff to white, fine to medium-grained, oolitic, non-argillaceous beds with common dolomite and dolomitic limestone. Chert is rarer than the underlying Osagean units, and quartz sand is common at the top of the section. Meramec limestones are interpreted as reflecting regional shallowing (Ruppel, 1985) that culminated in erosion and clastic deposition during early Chester time.

Meramecian strata are separated from overlying Chesterian strata by a physical unconformity, more pronounced in the western Panhandle. It is marked by limestone and quartz conglomerates and is thought to represent continued shallowing and the introduction of a clastic source in the area. Chester rocks are found in the middle and eastern part of the Palo Duro, and are less than 300 ft. thick—in contrast to the more than 1,700 ft. reported in the Anadarko (Ruppel, 1985). These rocks include light colored, fine-grained, oolitic limestone with rare chert and interbedded calcareous shales. Clastic to carbonate ratios of these rocks are higher in the eastern Palo Duro and to the south along the Matador Arch, implying earlier uplift there. Clastics are also more abundant (nearly 100%) north of the Amarillo Uplift in the Anadarko and Dalhart Basins (Ruppel, 1985).

I interpret Unit 3 as commencing with a relative fall in MFL, generating the erosional unconformity at the top of Unit 2. Shortly thereafter, MFL rose again, and deposition continued, first with a basal clastic sequence, followed by argillaceous dolomite. Clastics were probably eroded from the Texas Arch, although they might have been transported from another source. In either case, the clastic source was covered by rising water and limestone covered the Texas Arch. The decrease in chert content within the limestone also suggests a decreasing silica source from early Flood igneous activity. Deposition of Unit 3 ended with the onset of a new episode of tectonism that led to the development of new clastic sources that would become more pronounced during the deposition of Unit 4.

Unit 4

Unit 4 is a thick sequence of mixed carbonates and clastics that were deposited as the Palo Duro Basin underwent

structural changes that configured the present-day basin. Tectonism increased sharply at this time and the Palo Duro Basin began to subside. Structural changes triggered changes in source areas and basin depth which strongly influenced subsequent sediment thickness and composition. Sedimentation initially lagged behind subsidence, leading to the formation of a deep basin which was subsequently filled. Coarse-grained clastics were deposited near the uplifts that formed the basin margin and fine-grained sediments were deposited in the central basin. Unit 4 also includes thick carbonates, both limestone and dolomite which were deposited laterally between the granite wash and deep basinal clastic sediments.

Unit 4 consists of sediments classified as Pennsylvanian and lower Permian (Figure 2). These strata form the bulk of the basin fill (Figure 3). Pennsylvanian units average 2,000 ft. in thickness and range up to 4,000 ft. against the Amarillo-Wichita Uplift (compared to over 25,000 ft. of Pennsylvanian-Permian strata in the Anadarko). The Pennsylvanian is conventionally subdivided into four stratigraphic groups: Bend, Strawn, Canyon, and Cisco. However, these subdivisions are not easily applied in the Palo Duro Basin, and its Pennsylvanian sediments are described instead by reference to depositional systems (e.g., Dutton et al., 1982). These include: (1) fan delta, (2) shelf and shelf margin (3) high constructive delta, and (4) slope and deep basin.

The Pennsylvanian has been divided lithologically into upper and lower sections. These are considered to stratigraphically coincide with the Bend and Strawn Groups (lower) and the Canyon and Cisco Groups (upper) (Dutton, 1980). However, there are no regional marker beds or unconformities within the Pennsylvanian system. The lower section is roughly 45% of the system and includes mixed clastic and carbonate rocks. Fan delta deposits are prevalent in the lower section adjacent to block faulted uplifts. Carbonates in the lower Pennsylvanian section occur away from terrigenous sources, and the deeper basinal shales are found only in a small area of the southern basin, just north of the Matador Arch.

The upper mixed clastic and carbonate beds of Unit 3 mark the initial pulse of renewed tectonism. However, Unit 4 marks the most significant uplift, that resulted in the erosion and local transport of great volumes of carbonate and “granite wash” (coarse-grained, arkosic clastics) from the Amarillo-Wichita, Bravo, Matador, and Sierra Grande uplifts (Figure 4). As erosion continued and the basin subsided, fan deltas prograded into the basin reaching thicknesses of up to 1,200 ft. A fan delta is an alluvial fan that progrades into a water body from an adjacent highland (McGowen, 1970), characterized by steep gradients, short transport distance, and high-energy deposition. The typical vertical sequence includes prodelta clay and silt overlain by sand and clay of the distal fan and sandstone and conglomerate from braided fan channels.

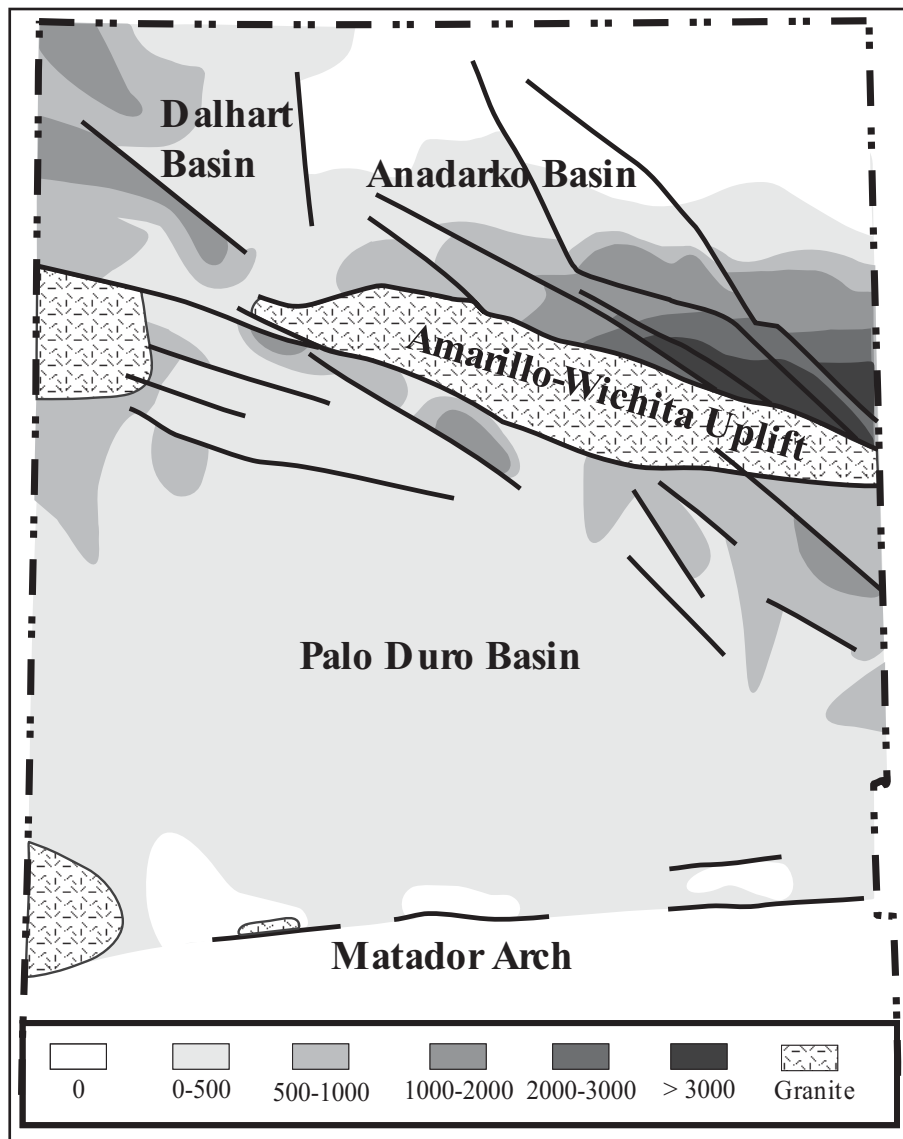


Figure 4. Distribution and thickness of granite wash facies in the Palo Duro Basin, after (Dutton et al., 1982).

As Unit 4 was deposited, faulting attenuated, relative sea-level rose, and the exposed uplifts were finally buried under a broad carbonate platform (Handford and Fredericks, 1980). This upper section contains abundant marine carbonate and fine-grained deep basin fill deposits. Before being submerged by Wolfcamp (lower Permian, see Figure 2) sediments near the top of Unit 4, the uplifts contributed clastics to the upper section as high constructive delta lobes (Dutton et al., 1982) in the Hardeman and eastern Palo Duro basins. These deltas are composed of elongate to lobate sandstone bodies that prograde into the basin. In contrast to the fan deltas, they are found primarily in the upper part of Unit 4, the clastics are usually finer-grained, and the sandstone bodies in these delta systems are thinner (up to 400 ft. versus less than 30 ft. in the uppermost sequences), suggesting a decrease in water depth (Dutton et al., 1982).

Carbonate shelf and shelf margin limestones and dolomites up to 2,800 ft. thick developed throughout Unit 4 basinward of the fan deltas, away from clastic source areas. The early shelf margin bounded a deep north-south basin (Dutton, 1980). The carbonate shelf opened to the south towards the Permian Basin and probably stood more than 200 ft. above the basin floor (Handford and Fredericks, 1980). Before the end of Unit 4 deposition, the shelf margin extended to the northwest into the Dalhart Basin, before migrating south into the Permian Basin. Although the carbonate buildups are not considered ecologic reefs, they are classified as stratigraphic reefs (Dutton et al., 1982), and algae, sponges, fusulinids, bryozoans, and brachiopods are common. Much of the shelf margin carbonate in the Palo Duro Basin is dolomite, apparently formed diagenetically since the mineral changes cross both bed and facies boundaries.

Deep basin and slope deposits consist of dark limestone, silty shales and thin sandstones. Dutton et al. (1982) postulated that clastics derived from uplifts migrated across the carbonate shelf and were deposited in the deep central basin by submarine fans.

I interpret Unit 4 as marking a resurgence of a tectonism more intense than had occurred in the Palo Duro Basin since Unit 1 formation. Most of the depth, sediment volume, and present day configuration of the basin were developed following this rapid pulse of tectonism. Although the waters were energetically generating carbonate deposits, the rapid uplift of the surrounding arches and the downwarping of the basin center led to a flood of clastics; early in the form of fan deltas of granite wash and later as a decreasing contribution of sand, silt, and clay in high-constructive delta systems. However, carbonate formation prevailed and by the end of Unit 4 deposition, limestone and dolomite covered the surrounding uplifts and the infilled deep central basin. This time marked the highest relative sea-level stand in the Palo Duro Basin's history.

The tectonic event that marks the onset of Pennsylvanian subsidence reversed the downwarping of the Southern Oklahoma Aulocogen with uplift of the Amarillo-Wichita and other basin-bounding blocks. There appears to have been a sharp and abrupt beginning to this tectonic

event with the rate of subsidence decreasing over the remainder of the Flood, allowing sedimentation to overtake the newly-increased accommodation space. It also appears that the initial phase of this tectonism manifested itself locally, as the individual basins were formed. It continued in attenuated form over a larger area, represented by the widespread but thick deposits of Unit 5.

Unit 5

Unit 5 comprises the middle and upper Permian system (Figure 5) and the red beds of the Triassic Dockum Formation (Johns, 1989). It includes a suite of mixed carbonate, precipitate (a synonym for chemical sedimentary rocks commonly called “evaporites” by uniformitarians), and clastic sedimentary rocks that marks the pulsating retreat of marine waters from the Palo Duro Basin (Table I) until the nonmarine clastics of the Dockum Formation blanketed the area. The apparent termination of marine sedimentation at the top of the Permian section marks the boundary between Units 5a and 5b, although Unit 6 may include some marine sediments and mark the true end of marine sedimentation in the Palo Duro Basin. Although this change marks certain changes in lithology and environment, it follows the same pattern set during the earlier cycles of Unit 5a. Unit 5 marks a time of subsidence and deposition across a wide area of Texas known as the West Texas Basin (Ewing, 1990). The Palo Duro Basin is merely the northern extension of that much larger depocenter, which captured more than 8,000 ft. of post-Wolfcamp Permian sediments alone in the Midland and Delaware Basins. Unit 5b has been interpreted as being deposited in a closed freshwater basin that extended from central Colorado to southwest Texas, was centered on the northern Midland Basin and filled by clastic sediments from surrounding highlands (Johns, 1989, see his Figure 1 inset). The maximum preserved thickness exceeds 2,000 ft. (Nativ, 1988).

Individual cycles in the Unit 5 progression consist of dolomite followed by anhydrite, followed by halite, followed by red beds of fine-grained terrigenous sediment. Combinations of these units are also present, i.e., mixed dolomite and anhydrite or mixed salt and mudstone. Vertical changes in Unit 5a reflect widespread lateral facies changes. As sea level rose, dolomite was formed across the basin. As sea level fell, anhydrite and salt would form in the broad tidal² environment. These rocks are interpreted by uniformitarians as having been deposited across marginal marine environments, similar to the sabkhas of the present-day Middle East. The lithofacies are thought to represent a series of marginal marine environments including (1) subtidal carbonates, (2) supratidal to subtidal dolomite, (3) lower sabkha anhydrite, (4) upper sabkha salt, and (5) terrigenous red beds (Gustavson et al., 1980). I believe that

System	Series	Group	Formation
Upper Permian	Ochoan		Dewey Lake Formation
			Rustler Formation
			Salado Formation
	Guadalupian	Artesia Group	Tansill Formation
			Yates Formation
			Seven Rivers Formation
			Queen Formation
			Grayburg Formation
			San Andres Formation
Lower Permian	Leonardian		Glorieta Sandstone
		Clear Fork Group	Upper Clear Fork Salt
			Cimarron Anhydrite
			Tubb Sand
			Lower Clear Fork Salt
			Red Cave
			Wichita
Wolfcampian			

Figure 5. Post-Wolfcamp Permian stratigraphy of the Palo Duro Basin. Gray areas show major salt units. Lateral variations across the basin cause differences in vertical sequences depending on location (after Gustavson et al., 1980; Dutton et al., 1982).

²“tidal” as used by uniformitarians and “tidal” as that it might be applied to the cyclical motions of the Flood obviously represents a distinction worthy of exploration.

Table I. Sea level during Unit 5 deposition as inferred from lithofacies distribution (after Dutton et al., 1982; Gustavson et al., 1980; Ramondetta, 1982; McGillis and Presley, 1981). Sea level, increasing from right to left (shown by dots), shows several cycles in the overall regressive trend of the late Permian.

Sea Level inferred from lithology: High	Low			
Middle/Upper Permian Unit	Dolomite	Anhydrite	Salt	Red Beds
Dewey Lake Formation				X
Ruster/Alibates Formations	... X	... X		
Tansill/Salado Formations		... X	... X	
Tansill/Salado Formations			... X	
Tansill/Salado Formations				X
Tansill/Salado Formations		... X		
Yates Formation				X
Seven Rivers Formation		... X		
Seven Rivers Formation				X
Queen Formation				X
Grayburg Formation				X
San Andres Formation		... X	... X	
San Andres Formation		... X	... X	
San Andres Formation		... X	... X	
San Andres Formation	... X	... X		
Glorieta Sandstone				X
Glorieta Sandstone		... X		
Glorieta Sandstone				X
Upper Clear Fork Salt	... X	... X	... X	
Cimarron Anhydrite		... X		
Cimarron Anhydrite	... X			
Tubb Sand				X
Lower Clear Fork Salt		... X		
Lower Clear Fork Salt		... X		
Lower Clear Fork Salt	... X			
Red Cave Formation				X
Wichita	... X			
Wolfcamp				

depositional cycles were generated by oscillations in relative MFL with red beds derived from newly-emergent clastic sources. When MFL rose, clastic sources were cut off and chemical sedimentation dominated. Overprinting the transgressive-regressive cycles of Unit 5 is an overall retreat of marine waters to the south marked by the southward advance of shelf margin facies over time (see Figure 2 of Ramondetta, 1982). This resulted in the deposition of red beds of Unit 5b, marking the end of the cyclic marine sedimentation.

The later morphology and hydrology of the area was influenced by the dissolution of Unit 5 salt beds at locations of outcrop and along faults (Gustavson et al., 1980). This phenomenon is especially marked along the breaks of the Canadian River and has been cited as a factor in the drainage pattern of the Pecos River and the hydrologic isolation of the Llano Estacado³.

I interpret Unit 5 as the sedimentary record of the retreat of Flood waters from this region of North America, with the Triassic red beds of Unit 5b marking the end of cyclic marine regression in this area. However, the retreat here was not abrupt or rapid, in contrast to the onset of the marine front recorded in Unit 2. Small cycles within the thick sequence demonstrate that the marine waters rose and fell cyclically as they retreated off of the continent. This is consistent with a gradual decline in MFL combined with ongoing tectonic movements associated with vertical uplift of major parts of the landmasses and vertical subsidence of the ocean basins. Rocks of Unit 5 are helpful in showing (1) the late-Flood geochemical preference of anhydrite and halite over carbonate, and (2) the limited emergence of nearby clastic sources.

It is possible that the West Texas Basin formed as a restricted inlier of retreating Flood waters. Tidal fluctuations associated with retreating Flood waters, geochemical changes in the waters themselves, and the increasing influence of fresh water from rain all probably contributed to the complex sedimentary sequence of Unit 5. But it is clear that this unit marks a retreat of marine waters from this area and the ascent of clastic sedimentation over chemical.

Unit 6

Unit 6 is represented by a very limited sedimentary record that includes outliers of Cretaceous in the southern part of the basin, in Bailey, Lamb, Hale, and Floyd Counties. These sediments include sands, shales, and limey shales of the Trinity, Fredericksburg, and Washita Groups that are common farther east along the Gulf Coast shelf margin in central Texas. They are interpreted as having been deposited in shallow marine environments.

I interpret Unit 6 as outliers of late-Flood regressive deposits that are prominent to the east in the Gulf Coast sequence. Their limited presence in the Palo Duro Basin does not provide much information for genetic interpreta-

³the "staked plains" were named for location markers implanted to guide travelers across this wasteland.

tion. Although erosion associated with late uplift of the Rocky Mountains probably removed some of the sediment column, it is not clear to what extent this occurred in the Palo Duro Basin, and thus to what extent a late marine pulse affected the region.

Unit 7

Unit 7 is composed of terrigenous sediments of the Miocene-Pliocene Ogallala Formation and overlying Quaternary loess and alluvium. There is an erosion surface between Units 5 and 7 that has removed most of Unit 6 and cut river valleys up to 150 ft. deep (Johns, 1989) into the top of Unit 5b. Clastic sediments were deposited up to 800 ft. thick on top of the red beds of Unit 5b. Coarser fluvial conglomerates and sands were deposited in paleovalleys and finer silts and clays, interpreted as eolian, were deposited in the interfluvial areas (Nativ, 1988). There is a general fining upward trend in the Ogallala (Nativ, 1988).

I interpret Unit 7 as nonmarine, post-Flood sediments derived from erosion and deposition of clastics during and after the uplift of the Rocky Mountains and the Great Plains. During this time, it is likely that the continents and oceans were moving towards a new isostatic equilibrium resulting from earlier mid-Flood tectonic readjustments in the earth's crust.

The Palo Duro Basin and the Energy Curve

The genetic units defined above can be useful for interpretation outside the Palo Duro Basin if a method of correlating them to other units can be derived. Physical correlation can carry some distance, but the diachronous nature of deposition in the Flood during both its transgressive and regressive phases presents difficulties. In this context, the *stage* of the Flood at a particular point is more important than the absolute time correlation. The geological energy curve of Reed et al. (1996) offers a possible means of correlating a given geologic sequence to the Flood stage and then allowing regional correlation to stage rather than absolute time.

The sequence of units in the Palo Duro Basin is consistent with deposition during the Genesis Flood (Figure 7). The initial tectonic and igneous event that led to the formation of the Southern Oklahoma Aulocogen, the ensu-

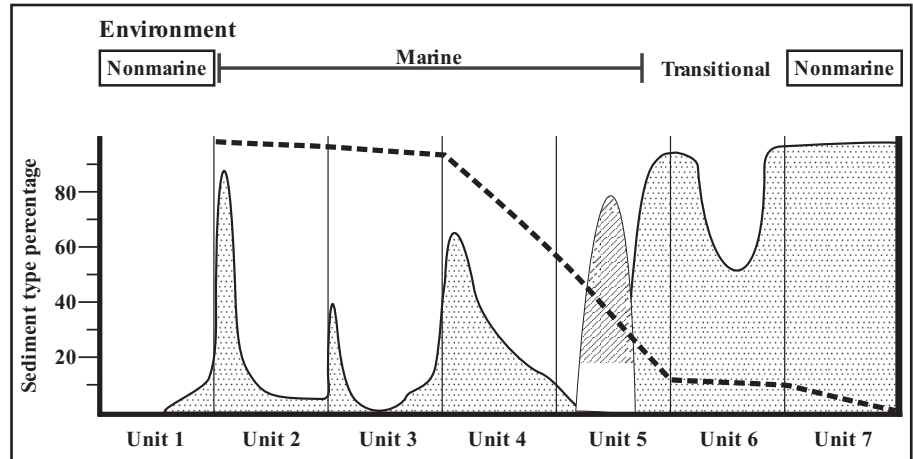


Figure 6. Lithology and inferred environment of Palo Duro Basin genetic units. Gray area represents an approximate percentage of clastics and white area represents approximate carbonate percentage. The patterned peak in Unit 5 represents precipitates. Clastic peaks at the beginning of Unit 1 and Unit 4 suggest a response to major tectonic events. General trend of Flood is seen in the nonmarine to marine to nonmarine transition shown at top of chart. The dashed line across the figure represents an uncorrected sediment accumulation curve, based on present day thickness of the units. Sedimentation rates were relatively slow during deposition of Units 2 and 3, increased during deposition of Units 4 and 5, and decreased again during deposition of Units 6 and 7. UCSA is an uncorrected sediment accumulation curve showing relatively thin units 2 and 3 followed by thick deposits in units 4 and 5, and thin units 6 and 7.

ing marine incursion recorded in the basin, a late-stage tectonic inversion, and the thick regressive sequence culminating in continental clastic sediments all point to the general sequence of the Flood outlined on the energy curve. Even different timing for a similar sequence elsewhere in North America does not preclude correlation of Flood stage via application of the energy curve.

The challenge to creationist stratigraphy is to demonstrate that the rock record is amenable to coherent interpretation by the Flood event both laterally and vertically. A step in that direction is taken by showing that the Palo Duro Basin and its fill show the gross characteristics expected of the Flood. Further demonstration should take the form of more detailed work within the basin, showing that features of the formations themselves are explicable within the short time constraints of the Flood. Also, interpretation should resolve the lateral extent of particular features of each Flood stage that can be identified at the Palo Duro Basin and identify others not represented there by reason of nondeposition or missing section.

Clues to the Nature of the Flood

Because the Flood was a global event and episodes within that event would affect large regions of the earth, informa-

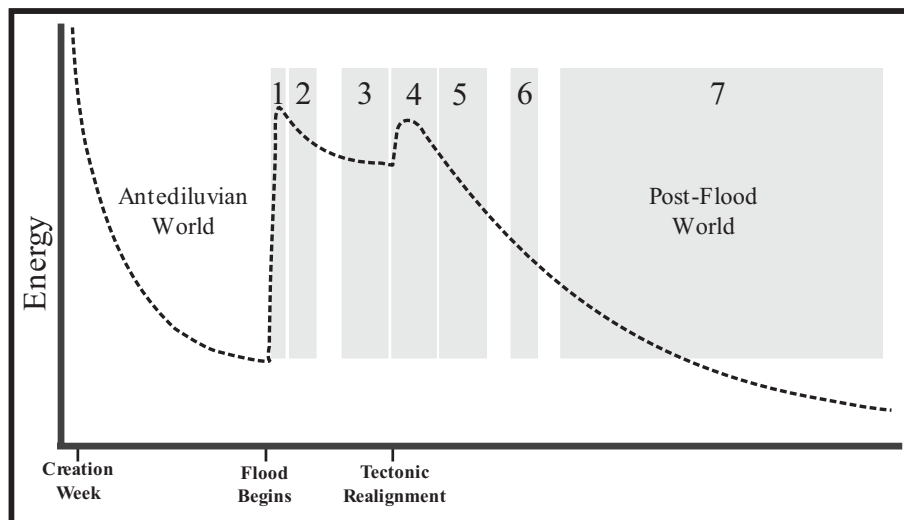


Figure 7. The position of the seven units relative to the energy curve. Unit 1 marks the tectonic and igneous onset of the Flood. Abrupt structuring and extrusive and intrusive events correspond to the initial increase in energy. Units 2 and 3 follow the curve during its transgressive phase. I correlate the base of Unit 4 with the mid-Flood increase in tectonism that signaled the onset of crustal reequilibration that prepared the ocean basins and continents to assume their present isostatic relationship. Unit 5 matches the decreasing energy and correlative regression of the Flood's waters, and Unit 7 was deposited under late to post-Flood terrestrial conditions. The thick alluvium of the Ogallala has been correlated by uniformitarian researchers to the uplift of the Rocky Mountains and Great Plains and the subsequent erosion and deposition of clastics following that uplift.

tion gleaned from specific areas such as the Palo Duro Basin can provide clues about the nature of the Flood in general. Extrapolation requires caution and must not exceed scope or confidence for local interpretation. However, evidence from the Palo Duro Basin suggests some tentative conclusions about the Flood that might be applied regionally, or even more cautiously on a greater scale.

Unit 1 provides the first clue. It represents an intense igneous and tectonic upheaval along the Southern Oklahoma Aulocogen. Extensional deformation of the crust was combined with the intrusion and extrusion of massive volumes of predominantly silicic magma. Its similarity to the Midcontinent Rift System suggests that numerous epicenters of extensional crustal deformation and associated igneous activity developed at the onset of the Flood. Defining these epicenters in terms of their locations, stress fields, and extent might help resolve questions about the tectonics of the early Flood and any potential role for plate tectonics in a creationist framework (Austin et al., 1994 versus Reed, 2001). The absence of thick sequences of nonmarine sediments at the Southern Oklahoma Aulocogen also suggests rapid inundation by marine waters, in contrast to the lag between the tectonic onset of the Flood and marine transgression observed at the Midcontinent Rift System (Reed, 2000).

The composition of Units 2, 3, 4, and 5 provide clues to the physical and geochemical systems that developed during the Flood. Following a thin basal lag, Flood deposits in the Palo Duro are composed predominantly of carbonates, both dolomite and limestone. The uprush of marine waters onto the continental areas, combined with epicenters of igneous activity provided a combination of temperature gradients, influxes of ions such as calcium, magnesium, and iron, and solution and outgassing of CO₂ and other gases. Given these conditions, it is reasonable to speculate that the physical progression of the Flood from transgression to highstand to regression was overprinted by geochemical changes in the waters themselves. If this is true, then clastic deposits would represent areas where the erosion, transport, and deposition of sand, silt, clay, and larger grains overwhelmed the underlying carbonate-generating system, resulting in an interruption of otherwise ongoing carbonate deposition (Figure 6). Uniformitarians commonly depict a change from clastic to carbonate depo-

sition as involving a change in environment over long periods of time. Away from clastic sources, carbonates would dominate. The presence of clastic sediments would not then necessarily imply the absence of carbonate deposition, only the relative dominance of clastic sedimentation. The presence of accessory minerals such as chert, glauconite, and pyrite might also point to volcanic sources of iron and silica.

Late-forming gypsum, anhydrite, and salt may then be the result of changes in the underlying geochemical equilibrium of the Flood waters, and not simply related to specialized environments where these minerals are formed today. An investigation into these questions would be well worth the time of any geochemically-minded creationists.

Unit 4 provides insight into a very significant event during the Flood. Regional tectonism was renewed and significant vertical motion occurred—as inversion along prior normal faults at the Southern Oklahoma Aulocogen. This vertical movement led to the formation of the basins of the southern midcontinent region as we know them today: the Palo Duro, Permian, Anadarko, Ardmore, Arkoma, Dalhart, and Hollis/Hardeman Basins (Figure 1) all formed during this episode. The intervening uplifts also formed during this time period. I believe that this regional tectonic event represents the initiation of the new crustal

equilibrium that resulted in drainage of the Flood waters into the present-day ocean basins. Vertical motions may have been first manifested locally on the continents and increased in areal extent even as it decreased in intensity. It may also be noted that mid-Flood deformation might have initiated in the continental interiors and then migrated towards the continental margins. A comparison of Units 4 and 5 shows that although both sections are thick, that formations of Unit 4 are restricted to the newly-developing basins, while Unit 5 contains beds of more regional extent.

Conclusion

Rejecting a time-stratigraphic framework for an event-oriented one correlated to episodes of the Genesis Flood provides a reasonable explanation of the Palo Duro Basin. The tectonic and igneous upheaval at the onset of the Flood (Unit 1), a transgressive carbonate section (Units 2 and 3), renewed structuring leading to basin formation near Flood highstand (Unit 4), and a thick cyclical regressive sequence (Unit 5), culminating in continental alluvial deposits (Unit 7) are all recorded in the fill of the Palo Duro Basin. Correlation beyond the bounds of the Palo Duro Basin may be performed by relating its event-stratigraphic units to a geologic energy curve which reflects Flood stage rather than absolute time. The relative position of these units on the energy curve can provide a comparative tool for other basins.

Reinventing stratigraphy to conform to the Biblical Worldview requires developing a logical structure consistent with foundational assumptions (Reed, 2001), but it also requires application to field examples. This overview of the Palo Duro Basin demonstrates that such an approach is both feasible and fruitful. Just what does the Palo Duro Basin tell us about the Flood? It speaks to the crustal disruption and associated igneous activity at the onset. It speaks to a geochemical drive towards carbonate precipitation and presents clastic pulses as overprints of that baseline. It speaks of mid-Flood renewed tectonism and basin formation. It speaks of cyclical regression of the Flood waters off of the continents as a new isostatic equilibrium is reached. Finally, and most importantly, it speaks to the ability to apply the Bible as a bounding framework for natural history.

This study of the Palo Duro Basin is an overview and cannot answer all questions. However, sometimes just asking the proper questions enables progress. In that light, this study raises several important questions for creationists to address. These include:

1. In addition to the West Texas Basin, many locations across the globe have a rock record that includes a vertical section of extensive salt and anhydrite deposition. The Jurassic in the Gulf of Mexico, the Trias-

sic and Jurassic of North Africa are just two examples of regional extensive salt and anhydrite formation. What is the origin of these deposits in the context of the Genesis Flood? Do these units reflect a unique geochemical phase of the Flood? If so, are they correlative across the globe?

2. The first set of questions leads to another. The assumption of a generally static geochemical marine environment over geologic time should be revisited by creationists. It is likely that the geochemistry of the Flood's waters underwent dynamic change and perhaps even started at a different equilibrium from that observed today. Evidence for these changes should focus on the chemical impetus to generate carbonates throughout most of the Flood (relative changes from carbonate to clastic sediments may be explained by relative rates of deposition). The presence of abundant chert, pyrite, and glauconite in older sediments suggests changes perhaps related to igneous activity, as does the relative rates of dolomite and limestone formation. Late precipitation of anhydrite, gypsum, and salt also bears greater scrutiny.
3. The crucial question of stratigraphic correlation by time or event (Flood stage) stands clearly as a divide which creationists must address. I have offered reasons why time is a poor correlation key for the rock record and I infer that the time-based geologic column is thus flawed and requires revision beyond the mere compression of its absolute time scale. I am aware that other creationists disagree with this approach (e.g., Tyler and Garner, 2000 versus Reed and Froede, 2000). It would be helpful to resolve this issue; if not, then we must agree to disagree and enjoin respect for each other's efforts.

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Book Reviews

He Made the Stars Also by Stuart Burgess

Day One Publications, Surrey, England. 2001, 186 pages, \$10

This is a delightful book, clearly written and arranged. Author Stuart Burgess is a design engineer with experience in the space industry. He wrote an earlier creationist book, *Hallmarks of Design* (1999. Day One Publications, Surrey England). Burgess discusses in detail a mature creation, solar system design, and extraterrestrial life. He also critiques science fiction and states some rules for not undermining biblical doctrines: *Wholesome* science fiction must have no aliens, evolutionary philosophy, or human superheroes. *Star Trek* and *Star Wars* clearly do not measure up in Burgess' view (pp. 148, 158).

For the creation of the heavens, Burgess suggests a *speeded-up stars theory* (p. 24). God supernaturally made star aging processes occur at near-infinite speed. The more distant the star, the more rapid the decay process and the faster was the light speed. After all of this light information

reached earth, rates of change then were reduced to what we now measure. In other words, like a video tape, the speed of universe aging was temporarily put on *fast forward*. The theory appears somewhat *ad hoc* and artificial, but no less so than many other theories about the fourth day of creation.

The book discusses six similarities between the Tower of Babel and the International Space Station. However, Burgess does not predict a further confusion of languages! Several problems on the high school level are included at the end of the book with answers. There is no index.

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When Christians Roamed the Earth

by Ken Ham, John Morris, Carl Wieland, Jonathan Henry, and Jack Cuozzo
Master Books, Green Forest, AR 2001, 192 pages, \$12

The six authors each take a chapter to give independent thoughts on the impact of evolution on society. The book title is based on the imagery of dinosaurs in earth history. This title may be somewhat confusing in view of the continuing Christian influence in society today.

Henry Morris' chapter provides a nice summary of evolutionary influence throughout history. Jack Cuozzo's chapter is the longest and is filled with his original writing style. He challenges evolutionists "to question their own theories as intricately as they question ours" (p. 77). Jonathan Henry's chapter asks some basic questions about the current search for new planets in space, a futile attempt to

gather evolution evidence. Carl Wieland gives new background on the moral decay of Australia. Authors Ken Ham and John Morris also provide solid evidence of the evolutionary denial of real data.

A final chapter would have been useful on strategies for promoting truth in a post-Christian world. The book has endnotes but no scripture or subject indexes.

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Human Consciousness and the Image of God

Stan G. Smith*

Abstract

The interest concerning the presumed evolutionary development of consciousness from unconscious matter has escalated during the latter half of the 20th century. As the historical framework of

such research is reviewed, challenges against such materialist perspectives will be presented in favor of traditional dualism, where consciousness and brain activity are viewed as different in kind.

Historical Background

Beyond genetics, human consciousness is becoming the major issue for evolutionists to unravel. Francis Crick has even suggested that the next great challenge for science will not be in quantum physics or microbiology, but rather in the understanding of how the human brain develops consciousness in the embryo (Bennett, 1997, p. 4). If ever any presumed evolutionary sequences were uncertain and unclear, the area concerning the origin of consciousness might get the biggest prize. This traditional mind-body dualism must ultimately be made to yield to a more materialistic perspective if evolution is to continue its reign. I shall therefore examine how evolutionists have tried to explain human consciousness. From the Greek philosophers to Kant most western thinkers were generally committed to some form of dualism. According to Bennett, Descartes was the first to formalize this dualistic perspective in terms of the mind-body problem, or brain-mind problem (Bennett, 1997, p. 29). Dualism views the brain, or body, as the physical organ housing our invisible mental operation. No serious scientist questions the fact that the brain as part of the body is material in its form and operation. Is the essence of "mind", however, something different in kind, or merely in degree? Dualism views brain and mind as different in kind. Evolutionary materialists, by necessity, must advance arguments that mental states merely differ in degree from measurable neuronal operation.

Since the last half of the 19th century Darwinism forced redefinitions for the development of every feature of the biological world. It would thus be necessary for evolutionists to consider human consciousness, but the efforts to provide any kind of tangible fossil evidence for Darwin's general biological theory was the main priority for most scientists at that time. There were some notable individu-

als, however, who were advancing their own opinions, or experiences, in the matter of human consciousness.

Well known late nineteenth century and early twentieth century psychologists such as England's George Romanes, and Mark Baldwin and G. Stanley Hall in the United States, turned to evolutionary explanations of human behavior as well as the psychological development of children, seeing the later as a recapitulation of the evolution of the species. (Combs, 1996, pp. 181-182)

Another early example of someone proposing an evolutionary view of consciousness was Richard Maurice Burke (1900). Dr. Burke's categories for the conscious were a) simple consciousness, b) self consciousness, and c) cosmic consciousness. Burke discusses these three categories of consciousness and emphasized the development of the intellect as associated with such things as the development of language and color sense in vision which he borrowed from the noted Max Mueller. He further cited historical examples of well-known individuals (Jesus, Gautama, Mohammed, etc.) who in his opinion possessed the crowning illumination of cosmic consciousness. Burke also extolled and pointed to England's George J. Romanes, who wrote *Origin of Human Faculty* (Romanes, 1889). Although set in a framework of religious humanism (vs. modern secularization), Burke essentially maintains an evolutionary perspective of punctuated enlightenment. Burke's *Cosmic Consciousness* apparently stimulated further investigation into the evolution of mind and became a seminal work for the New Age movement. Consistent with Burke's presentation of a new religious humanism, a progressive interest in spiritualism was seen to accompany the rise of evolutionary thought in the latter half of the 19th century.

Beyond these early beginnings, investigations of mind and consciousness moved through such familiar names as Pavlov, Freud, Jung, Crick, and Skinner with a presumed materialist, and sometimes pantheistic, basis for the operation of the human psyche. The most rabid materialist in

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this group could perhaps be represented by behaviorist B. F. Skinner (1971), whose chilling dehumanization of man is represented by his book *Beyond Freedom and Dignity*. Skinner makes the dogmatic assertion that man is no more than a highly complex sociological machine conditioned by a multitude of stimulus-reflex events. In one summary remark, we are confronted with his assertion: "To man qua man we readily say good riddance" (Skinner, 1971, pp. 200–201).

Finally, we arrive at the cultural milieu of our day where everything from strict neurophysiologists to New Age psychics exist with their attendant perspectives on human consciousness. Serious scientists restrict themselves to empirical demonstrations of operational mechanisms for proposed evolutionary change. Such experimental investigators are concerned with how syntax (logical structure for processing information), semantics (meaning and understanding), and qualia (quality of discrimination and awareness) could ever arise from a neural network (Bennett, 1997, p. 31). Unfortunately, it is easy to see how a pseudo-scientific community exaggerates limited findings to drive our culture toward a revived paganism as illustrated in statements like the following:

It will come as no surprise that the history of ideas concerning evolution and consciousness presents a shifting ground, rife with confusions between the three types of evolution above: biological evolution, historical evolution, and the grand evolutionary synthesis. As we have seen, both Henri Bergson and Teilhard de Chardin considered the inner evolution of consciousness to be a counterpart if not a direct function of the evolution of complexity in the nervous system. Their descriptions of the progressive development of consciousness, however, owe more to their philosophic dispositions than to their dedication to evolutionary biology. Nor were they particularly interested in individual psychological or spiritual growth. . . . They were scientific mystics making the best of both the scientific and spiritual worlds of their day.

Sri Aurobinbo's evolutionary spirituality is of the second type, that is historical. At bottom it is founded almost entirely on traditional Indian ideas of the progress of the spirit through many incarnations toward identification with subtle levels of being. (Combs, 1996, pp. 185–186)

Returning to the empirical side of scientific investigation, some current schools of thought on consciousness, as discussed by E. M. Macphail (1998, pp. 204–213) are summarized in Table I.

Macphail indicates that functionalism is the major orthodoxy held by the professionals in this field (Macphail, 1998, p. 213). As a neuroscientist, M. R. Bennett stresses

Table I. Current schools of thought on consciousness.

Dualism: The classical view that the brain-mind problem is understood in terms of a spirit-body operation (dual essences different in kind)
Anti-reductionists: A position that denies the brain-mind problem can be solved by linking mental and physiological events, yet holds that neurological activity is the cause of mental activity (reminiscent of philosophical positivism)
Logical behaviorism: A modification of the behaviorist view suggesting that an attempt to correlate brain-mind categories is invalid (problem with the semantics in the use of descriptive categories—different from Skinner's view which regarded brain-mind operation as cause and effect aspects of the same thing)
Neurophilosophy: Strict materialist view which suggests that mental activity can be correlated with neurological events (microscopic or component function of neural activity)
Functionalism: The view that consciousness is a product of functional organization of neural networks (macroscopic integration of neural activity)

the neuronal basis for consciousness (Bennett, 1997, p. 88). It would appear that an evolutionary scientist would need to integrate both neuronal and functional activity in developing a comprehensive view of the evolutionary process which he proposes.

Neuroscience (neurophilosophy) and functionalism seem to represent microscopic and macroscopic perspectives of the overall problem, much like what is commonly termed as microevolution and macroevolution. An appropriate analogy, which may initially favor the functional viewpoint, can be seen in using the letters of the alphabet and any book written with them (not a new analogy). Ultimately, we agree that it is the functional combination of the letters, as sentences and paragraphs, which carries the information. However, if I could completely remove a single letter (eliminating all the a's from the text), I could potentially make a radical change in the information. Should I remove all the spaces, commas or z's, I would generate a less catastrophic change. However, the point is that the individual components, even within a synergistic environment, are of extreme relevance; and the strict materialist seems to have less ground at this point in determining which carries more importance in the question of consciousness, the "letters" or the "sentences" of our neural operation. He must explain both simultaneously, granting that it is even possible to do so, which is doubtful. However combined though, these materialist positions feed the hope of creating artificial intelligence.

Significant challenges to the functionalist position on the other hand have been made. In particular, Macphail discusses how language and mathematical intuition pose significant challenges to functionalism. No one would deny that there have been overwhelming advances made in modern computer systems and robotics due to our systematic investigation of logical processes in the biological and physical sciences. It is in the arena of mathematical intuition, however, that I believe, and will attempt to demonstrate, that dualism remains the superior perspective with regard to the brain-mind problem. First, though, let us view some sensational yet interesting avenues in the scientific enterprise related to reality and consciousness, which have stretched or discomforted the evolutionary community.

On the Far Side

The famous British Darwinian evolutionist, Richard Dawkins (1989), has proposed the idea of the *meme*, a gene-like “unit of cultural transmission, or a unit of imitation” (Dawkins, 1989 p. 192). Memes are mental replicators which behave like viruses in the survival of the fittest game at the level of brain activity. It is proposed that memes can infect a brain and later be passed on to others. Dawkins developed a view in which a world of such memes compete for survival in the minds of conscious beings. Successful memes (ideas which are remembered or retained) are therefore selected for residence to be passed on to future minds. This would be an amusing scenario except that brilliant evolutionists, such as Dawkins, are hard pressed to seriously invent such absurdities to reflect the difference they see between the rapid changes which occur in language and cultures compared to genetic evolution (Dawkins, 1989, p. 189). Dawkins, himself, is severely plagued by critics from the evolutionary camp itself, such as rival Steven J. Gould; but he presses on because he is basically correct in seeing a real difference in genetics and cognitive or cultural behavior. With respect to the Dawkins position, it seems that he is just advancing a different kind of dualism, somewhat similar to “soul” particles interacting with material particles as proposed by the ancient Greeks (Macphail, 1998, p. 27).

I was recently reminded by a colleague, H. O. Olney, that another area of interest relevant to the mind-body problem would be found in the research concerning near death experiences (NDE). Although many scientists would dismiss such studies as serious science, long-term researchers like Kubler-Ross (1970) have attempted to analyze near death phenomena. Feelings of love, a tunnel of light, review of life events, and much more have been common elements within the shared experiences and memories from a variety of individuals who do not know

one another. Any committed materialist would have to reconsider his position in favor of traditional dualism, if he took this research seriously. Consequently, in the last three decades there have been significant attempts to progressively objectivize this research. Additionally, NDE research is fueled by a growing public interest, which is unlikely to wane as the case load grows.

Even more sensational and less palatable to the scientific community is a current resurgence in what is referred to as deliverance ministry. Aside from the extreme emotional states that virtually all people move through, a growing number of Christian pastors and laymen are concerned that various forms of bizarre behavior is the result of demonic influence. Though demon possession may seem laughable to many scientists, so-called “multiple personality disorders” are seriously treated in our psychiatric hospitals. Secularizing the terms do not solve any problems. My point in mentioning this example is that such conscious behavior mandates a sufficiently unique explanation from the evolutionary scientist. He may have a devil of a time in identifying the transitional forms, or states, of consciousness to support his materialist view in this arena.

Finally, another scientific controversy, which proves somewhat unsettling to the dogmatic materialist, is the Anthropic Cosmological Principle (Barrow and Tipler, 1986), or sometimes simply referred to as the anthropic principle. Scientific research has demonstrated how “fine-tuned” this universe is in order to manifest the stable forms observed within it, including life itself. To suggest that the universe must be the way it is *because* we are the way we are, sounds like confusing the ends with the means or rather the cause and effect with regard to both life and the universe. Although physicist Frank Tipler (1994) does not advocate a cosmic Designer or personal Creator, his basic proposition remains haunted by virtue of the language in his presentation. For example, Tipler discusses the Many-Worlds Interpretation associated with quantum physics which suggests that our unique circumstances have occurred amidst a realm of many potential universes. Tipler’s Omega Point, a rather impersonal entity representing the completion of finite existence, essentially becomes a new “god”. Skirting the classical consideration of a classical Biblical Creator, Tipler then begins to suggest the Many-Worlds Interpretation of reality gives us free will and his Omega Point will resurrect us. These certainly seem to be strained and bizarre departures from any straight-forward reading of the Bible. The natural evidence for the miraculous ordering by an invisible hand for our finely tuned cosmos continues to be rather compelling. Perhaps that is why Tipler felt drawn to write more about “God”, albeit a more pantheistic god. However, a more personal “ghost in the machine” seems to haunt the real universe if not Tipler’s technical definitions.

Language and Mathematics

Of all the objections to the evolutionary kinship of man to animal, the most readily observed and easily perceived difference is that of language. If chimpanzees really possess 98% of our human DNA, why should they not communicate proportionally? If ferns have more chromosomes than we do, then why are they not the dominate species on earth? (I am rather apprehensive about how some New Age philosopher might answer this last question). Genetic studies have been dramatically fruitful in the last three decades. However, owing to the above examples, genes cannot be primarily central to the issue of consciousness from what we have observed and learned.

Mathematics is a subset of language. Macphail (1998, pp. 215-216) noted that Roger Penrose and John Lucas used mathematical intuition to prove how minds cannot be computers, although Penrose still regards the mind as a physical system (Macphail, 1998, p. 215). It was only natural that Penrose and others, who clearly saw that minds could not be machines, would begin questioning whether quantum mechanics or chaos theory could explain the brain-mind problem. I have already dealt with quantum mechanics (Smith, 1986) and chaos theory (Smith, 1994) as presumed evolutionary mechanisms and refer the reader to those papers for more extensive consideration.

Oxford philosopher John Lucas (1961) has used Gödel's Theorem in the area of consciousness to support dualism. He uses this theorem to illustrate how the human mind cannot operate as a machine. In summary Lucas stated that:

Gödel's theorem must apply to cybernetical machines, because it is of the essence of being a machine, that it should be a concrete instantiation of a formal system. It follows that given any machine which is consistent and capable of doing simple arithmetic, there is a formula which it is incapable of producing as being true—i.e., the formula is unprovable-in-the-system but which we can see to be true. It follows that no machine can be a complete or adequate model of the mind, that minds are essentially different from machines. (Lucas, 1961, p.113)

Lucas proceeded thereafter to cover objections to his basic thesis through discussing how progressive improvements in sophisticated machine operation will still be subject to the limitation of Gödel's Theorem. Reviewing Lucas' insightful paper left me wondering if Gödel's brain was a sophisticated machine, could it have developed this famous theoretical proof? In a somewhat similar, Gödel-like fashion, let us consider the concept of infinity in the human conscious.

Infinity

In a familiar example of Zeno's paradox (Bergamini, 1963, p. 45), the fleet-footed Achilles is matched against a tortoise who is given a head start of 10 stadia (or for modern ears, let us use 10 feet). Achilles, we shall say, is 10 times faster than this turtle but finds that by the time he has run 10 feet the tortoise has moved ahead one foot. As Achilles again moves another foot, this tortoise is found to have moved ahead by 0.1 feet. On it goes until we realize, as Zeno would have us imagine, that Achilles can never beat the tortoise, even if he is *faster*. Oh my; what is wrong with Achilles?

Zeno expressed this paradox in other forms, but the same logic applies. Zeno has set up his problems so that motion, or position, is viewed as an infinite continuum. We find ourselves using the same assumption as Zeno when a geometry teacher asks how many points are on a line segment. The answer, we have been taught to exclaim, is—an *infinite* number! We go on to systematically use this notion of infinite continuity in calculus, which easily becomes a very natural way for us to perceive things. But wait a minute—would not Achilles actually beat this turtle *in reality*? Yes, he will, because the real universe is manifested in discrete chunks of matter and energy in space. Despite how fast or slow Achilles may be compared to the tortoise, his *real* motion is advanced through discrete steps or strides. *Real* line segments, represented on a blackboard, are composed of one three-dimensional chalk molecule after another—not an infinite number of abstract dimensionless points. The *real* universe is *quantized*. At some point during the race, Achilles will put a *real* foot down and that *quantum unit* will put him ahead of that reptile.

Interestingly enough, if reality is manifested in discrete or quantized form, where did the notion of an infinite continuum come from? How is it that a *real* Zeno, or anyone else, can frame a paradox or geometry problem in terms of an infinite notion? The most paradoxical feature of Zeno's paradox is Zeno. The ultimate paradox in the universe is man, a finite creature who can reason systematically in terms of infinity.

Evolutionists hope that science will one day produce a computer that will satisfy the Turing criteria and truly mimic human intelligence. However, could a computer ever handle the notion of infinity in the intuitive style of a human being? Although the mathematical operations of commercial computer programs such as Mathematica and Maple are impressive, experts in the computer field have assured me that these mathematical programs still only use a glossary or catalogue of pre-programmed mathematical forms for their calculus operations. Although some programs have produced interesting solutions to geometric proofs, it is unlikely that computers will ever perceive or

derive their mathematical forms in the manner which Newton or Leibnitz did. Indeed, college freshman are able to learn about infinite series and limits in an intuitive fashion which computers cannot duplicate.

Considering what evolutionary thinkers have said about consciousness, I propose general and special principles involving this idea, or perhaps *meme*, of infinity. Stated as a question the general proposal is as follows:

General infinity principle: If all properties of the universe are ultimately finite and quantized, from where could any conscious notion of infinity, in any form, be derived?

Furthermore, specific to man, the special form of this would be asked as follows:

Special infinity principle: If the operation of a finite human brain is electrochemical in nature, and quantized in its operation, how can a person ever reason (systematically) in terms of a notion such as infinity, or an infinite continuum?

No number of finite states in brain activity could account for any real meaning for the concept of infinity. How can a type of consciousness arise that generates ideas outside the same universe that presumably produced such consciousness? How can any conscious creature think thoughts outside of the strictly quantized reality from which it supposedly evolved? The obvious answer would appear to be that consciousness of the infinite could not evolve from a finite, quantized universe or be produced from quantized brain operation. It appears that some features of human consciousness are clearly from another realm altogether. How could man therefore have evolved from this universe? It seems apparent that he did not. Infinity is the province of God, and man thinks in terms of infinite propositions because he has been fashioned after the image of God.

Summary

The proverbial “man-on-the-street” (who has not been overly contaminated through educational propaganda or *higher learning* as are some of us) *intuitively* knows that minds, people, and pets are not machines, even without Godel’s Theorem. When he loves his wife, plays with his kids or his dog, or is perhaps lied to or deceived by another human being, he does not generally conclude that such behavior is anything machine like. For those of us, sufficiently contaminated, we make *rational* demands for answers in detail. Ironically, though Macphail is optimistic over experimental investigations in the area of consciousness, he recognizes that as yet evolutionists have no rational proof of rationality.

...we are a long way from anything that might be regarded as ‘proof’ of the way in which self-consciousness evolved. (Macphail, p. 227)

When we consider wave-particle duality, it is we (rightfully so) who rack our brains over the meaning and mechanism associated with this phenomena; the various atomic particles and forms of radiation go about their business unencumbered. Despite our demands to know, science is arriving more and more each day at what we cannot know, and it is this idea of consciously knowing that we have been considering, even when it involves consciously knowing what we cannot know.

Almost 3000 years ago, King Solomon made a very interesting comment concerning eternity, perhaps implying the notion of infinity in general. Taking some liberty at clarifying this passage it reads:

He (God) has made everything beautiful in its own time: also He has put eternity (infinity) in their heart (mind), so that no man can determine what God does from the beginning to the end. (Ecclesiastes 3:11)

When I think about various limits or restrictions involved in physical laws, I am reminded how God has restricted our knowledge to prove that we are but creatures – not machines, not self-evolved mechanisms, but *created* beings. This is our inherent glory and limitation within the real universal system. He has done this for His own glory as the Creator, for only in Him are all things (mathematical or otherwise) sufficient and complete.

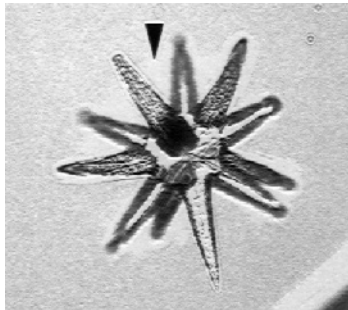
The body cannot produce mind, and man is not a machine. Man *is* the proof of God; and the nature of our consciousness is evidence for that proof. Our consciousness reveals that we really are made after the image of God, but our ignorance allows us to see and respect who God *really* is.

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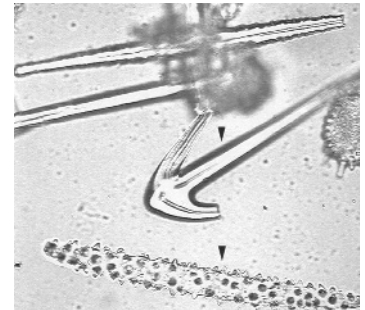
The Spicules of Sponges — A Photo Essay



In their natural or artificial forms, you use them every day to wash your car, your body and your dishes. Yet, do you really know that much about them? Sponges (Phylum Porifera) are considered by many scientists to be very ancient and primitive organisms. Boasting some

10,000 species, mostly marine varieties, they have no nervous system or musculature, but are comprised mostly of unique filter cells that are studded with whip-like cilia. Sponges have three general body layers, an outer layer of contractile type cells, an inner gelatinous layer, and a layer of ciliated cells. With these billions of cilia, all beating in unison, sponges can pump ten times their own body volume of water per hour, which they must do because they are filter feeders. Many sponges are very slow growing, and some scientists have estimated some of them to be 5,000 years old, making them possibly the oldest living individuals on the planet. Sponges also have an internal skeleton of sorts, made up of trillions of microscopic spicules, as you see pictured here in a variety of shapes.

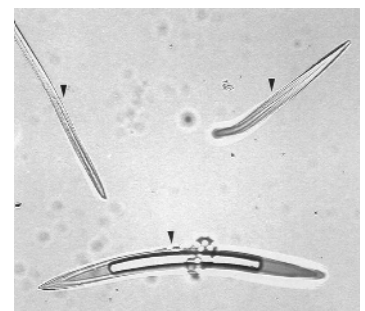
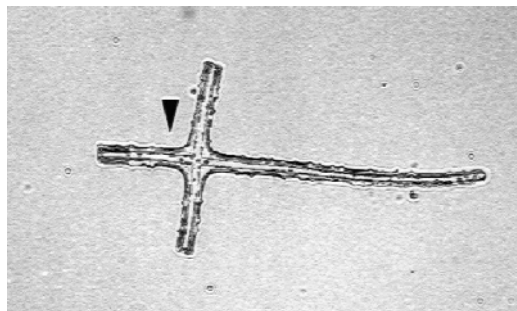
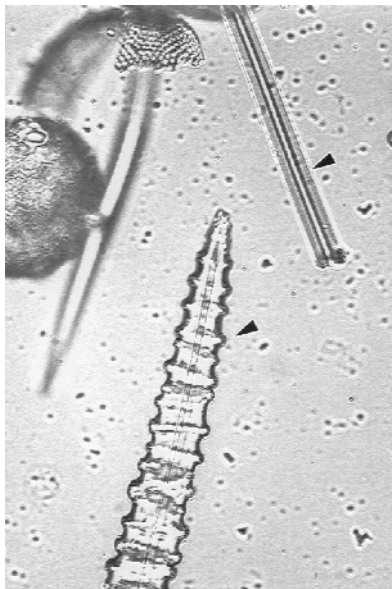
Spicules are constructed of pure silica or glass (some varieties of sponges construct spicules of calcium carbonate). To quote the Queensland Museum,* “Sponges have no tissues or sensory organs, but they do have many different types of cells with many different



functions that carry out normal bodily routines, including a primitive cell type (called an archaeocyte, an amoeboid-like cell), that is totipotent (able to change functions as required by the sponge, [e.g. secrete the skeleton, form the epidermis, become feeding or reproductive cells, etc.]).” Unless you missed it, these tiny glass shapes are made by amoeba-like cells that have the ability to secrete pure glass into these amazing shapes. Primitive, indeed!

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*<http://www.qmuseum.qld.gov.au>



Book Review

Biology: Principles and Perspectives, 4th edition, by John Silvius
Kendall Hunt Publishing, Dubuque, IA 2001 459 pages, \$72.50

I am pleased to report on a college-level textbook that not only provides a creation perspective, but also a biblical view on the sanctity of life and the environment. The textbook introduces students to every area of biology from ecosystems to molecules and challenges them to evaluate biological concepts and issues based upon the sound, biblical foundations that spawned western science. The book now offers a CD-ROM with graphics to help the instructor prepare overheads and handouts. As a college biology instructor, I am happy to offer my students a balanced, yet biblical perspective in all areas of general biology. For the past five years I have taught general biology at a Christian College with this text and have seen the book gradually expand and improve with each edition.

The book's strengths include its presentation of the environment from a Christian perspective, along with its biblical stance on creation and bioethical issues. In an age when secular humanism reigns it is refreshing that a college-level biology text presents a clear and balanced presentation on vital issues. As human cloning, stem cell research, evolutionism, and new age environmentalism gather the news headlines, the thoughtful Christian has at their disposal a resource with biblical answers. The end-of-chapter questions, activities, and web site explorations are helpful to the teacher and student for reinforcing concepts.

The book was written for a semester long, general education course (nonmajors) in introductory college biology. At my college, we have adapted the book's use for a two-semester biology majors class. We have made this adaptation by utilizing other supplements including a lab manual and photoatlas. The book provides information to students that allows them to reason analytically and to arrive at their own decisions concerning the origin of life, the environmental and pollution crisis, medical ethics, and biotechnology.

As a former Advanced Placement (AP) biology teacher in public schools, I believe the text could be useful to high school teachers looking for resources and ideas to present biology from a theistic and ethical point of view. Chapter 15 presents essential creation/evolution biology issues, such as micro- vs. macroevolution, and presents alternative perspectives of intelligent design and creation science theories. Materials for teaching high school courses like AP biology and anatomy and physiology from Christian perspective are limited. Although several books such as *Of Pandas and Of People* are available on creation/evolution there are no Christian texts that address current topics in biomedical ethics, the environment, and other bible-sci-

ence controversies. As a former public school teacher, I believe this book would be a valuable resource in providing a balanced perspective in the classroom. In addition I would recommend home school parents to consider this book for their library to add information to the biology curriculum.

The text's perspective is sound and problems at the end-of-the-chapter are useful for biology and premed majors. It can be adapted for Christian high school, home school, and even public school use. It emphasizes conceptual learning and does not aim to present complete coverage of every human body system. Although the graphics have come a long way since the first edition, a few illustrations on the human body could use improvement.

In summary, although there are minor weaknesses, I appreciate Professor John Silvius for pioneering this text to meet a growing need for a college - level, creation biology textbook. Very few Christian professors have been willing to invest time, money, and effort to write a 400-page biology text. For Dr. Silvius' faithfulness to the Creator, and his desire to improve this text with few external rewards, I applaud his effort in writing and revision. To my knowledge, there is only one other college-level text on the market for biology students, *Designs in Biology* (Lester, Howe, and Englin, 1997). For the college biology teacher, I highly recommend they have both on their bookshelf. Each text provides a different approach to biology from a creation viewpoint and each has made its contribution. Finally, I believe there is a tremendous need for Christian biologists to write a more extensive text that not only covers the entire year in biology, but one that is in color, has ancillaries, and support that will give secular publishers a run for their money. Then, Christian students of biology will be able to "study to shew thyself approved unto God, a workman that needeth not to be ashamed, rightly dividing the word of truth" (2 Timothy 2:15) in biology.

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Darwinism as a Factor in the Twentieth-Century Totalitarianism Holocausts

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Abstract

The movement today known as Darwinism was one of the factors leading to the loss of an estimated over 400 million lives, as well as enormous suffering inflicted on more than a billion people. It is well-documented that Darwinism was a major influence in the rise of Naziism and Communism

and it was one of the factors involved in numerous wars and conflicts. The death toll from several holocausts and wars is enumerated. The role of Darwinism and other factors leading to these holocausts and wars is evaluated and contrasted with the Bible's teaching on war and racism.

Introduction

It is well documented that acceptance of Darwinism and loss of basic Christian influence were factors involved in the rise of Nazism, Fascism, and Communism (see Azar, 1990; Bergman, 1999; 2001a; 2001b). In the words of Azar (1990, p. 218) the "vicious ideologies of the first half of the twentieth century—Communism, Fascism, Nazism—paid homage to evolution." Holden notes that Darwinism had

been used to provide intellectual support to a multitude of cruel and vicious policies. Causes which have been justified by Social Darwinism include, slavery, imperialism, racism, genocide, the Holocaust, Fascism, Communism, war, and not helping the poor, to name but a few. Where previously there was no clear intellectual justification for most of these causes, Darwin provided one, and ... his justification had the backing of many reputable scientists of his day. ... among historians with no axe to grind this is not controversial, although it is rarely expressed this directly, that Darwin must be listed as one of those responsible, along with numerous Nazis, for the Holocaust. Similarly Darwin must take an impossible to define share of the blame for many other horrors of history, some of it quite recent history (2000, pp. 2,3).

Although Darwin's goal in developing his concept of evolution was very clear, he never openly or directly challenged the Scriptures or Christianity because he felt that an indirect approach was far more effective (Perloff, 1999 p. 152). He wrote in 1873 to his son that openly opposing

Christianity was far less effective than a "back door" approach:

Last night Dicey and Litchfield were talking about J. Stuart Mill's never expressing his religious convictions, as he was urged to do so by his father. Both agreed strongly that if he had done so, he would never have influenced the present age in the manner in which he has done. His books would not have been text books at Oxford, to take a weaker instance. Lyell is most firmly convinced that he has shaken the faith in the Deluge far more efficiently by never having said a word against the Bible, than if he had acted otherwise. ... I have lately read Morley's *Life of Voltaire* and he insists strongly that direct attacks on Christianity (even when written with the wonderful force and vigor of Voltaire) produce little permanent effect: real good seems only to follow the slow and silent side attacks (quoted in Himmelfarb, 1962, p. 387).

A common objection to the conclusion that Darwinism had some important influence on the Nazi and Communists holocausts is that Darwin himself was evidently a good husband, an excellent father, opposed slavery, and never openly opposed Christianity. In response to this Holden concluded the fact is "Darwin was the first Social Darwinist" and the argument that you "can't blame him for the Holocaust" because "as a person he was not such a bad guy" is erroneous

unless you are going to claim Darwin was a deeply stupid man, (an opinion I certainly don't hold), he must have known the use of his theory would be put to. Darwin's personal qualities also seem irrelevant... Hitler was nice to his dog and mistress ... absolving Darwin for the crimes of other Social Darwinists, is like Dr. Frankenstein saying, "That monster I created, the killing spree it has gone on, well, it is nothing to do with me" (2000, p. 4).

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All scriptural quotations are from the *New International Version*. Tyndale, Wheaton, IL.

Holden also concluded that Darwin “clearly” anticipated the use to which his theory was applied, that Darwin was a racist, and he anticipated

the alleged “perversion” of his theory, and his theory DID result in a lot of suffering (the only question being how much we can attribute to him, which is historically unanswerable with precision), then although I hesitate to use the term, judged by its historical impact it seems to me [to] be quite reasonable to call Darwinism evil. Especially since the theory is basically dogma and can not as claimed explain the origin of species ... if the theory was true, one could hardly criticize it, as any attempt to censor science is dead wrong, and if that is the way the universe is, we just have to get used to it (2000, p. 4).

Less well known is the influence of Darwinism as one of the causal factors of World War I. In the 1870s and 1880s, the philosophy of Darwinism spread throughout the Western world “where it exerted a considerable influence, before reaching its apogee in the radical racist theories of National Socialism (the Nazis)” (Wehler, 1985, p. 179). One of many turn-of-the-century examples of the voluminous literature devoted to popularizing Social Darwinism is the 1913 literary opus written by General Bernhardt, *Vom Heutigen Kriege*, which expounded the thesis that war was a biological necessity because it helped rid the world of the less fit.

This view was “not confined to a lunatic fringe, but instead won wide acceptance especially among journalists, academics and politicians” (Carr, 1979, p. 217). These views were dominant at the highest echelons of the German government and intelligentsia. At the outbreak of World War I the German Chancellor, Bethmann-Hollweg, shared the widespread belief that a conflict between the superior and inferior races was inevitable (Carr, 1979, pp. 216–219). In 1912 the German monarch even referred to World War I as a Darwinist “selectionist racial war,” with the Slavs and other inferior races (Kellogg, 1917). Holden notes that the

widespread and complacent attitude that war was inevitable, natural, and beneficial in weeding out the inferior races, is generally cited as one of the many causes of the first world war by careful authors. An American, Colonel House, was appalled by the attitude of resigned complacency and bellicosity he saw when he visited Europe in 1913, and which was to a very large extent the fault of Darwin’s writings. Further evidence of how seriously Social Darwinism was taken at the turn of the century is provided by the propaganda issued by the Pan-German league and other groups within Germany (2000, p. 1).

For this reason, the losses caused by World War I also should be included as part of the estimated death toll caused in part by the Darwinism movement.

The Cost of World War I

Over 5,300 major formal wars have occurred in the last 5,000 years, producing a cost in money and loss of lives far worse in the 20th century than ever before. A rough, conservative estimate of the number killed in Western wars alone for the last four centuries is 68 million (Hersch, 1931; Wright, 1942).

One Harvard study evaluated the 902 major wars that occurred between 500 B.C. and A.D. 1918, and concluded that the number of combatants and casualties involved in the first World War was seven times larger than all of the 901 previous recorded wars combined (Foster, 1945, p. 6). Germany’s losses in World War I were estimated at 1,824,000 dead and 4,247,600 wounded; Russia’s losses were 1,664,800 dead and 3,784,600 wounded. The total dead from all fighting for World War I was over 23,000,000 (Roberts and Kloss, 1979, p. 153), and both military action and war-caused disease and famine deaths were estimated to be over 40,000,000 persons (Hersch, 1931).

The Cost of World War II

The total direct and indirect cost of World War II was *four times* greater in extent than World War I—around four trillion 1945 dollars (Foster, 1945, p. 6). It took the lives of over 40 million civilians and men in uniform, which was about the size of the under 18 population living in the entire United States at the time (Grattan, 1949). These losses must be viewed in terms of Hitler’s inhumanity. For example, as to his designs on his former ally, Russia, Payne notes:

Unlike Timulane, Hitler never offered excuses for his massacres. He gave orders that Leningrad should be leveled to the ground and the entire population massacred, and he reserved a special fate for Moscow. Not one person was to be left alive and not one stone was to be left standing on another, and the rubble of the city was to be concealed under a vast lake. The Sonderkommandos were under orders to kill men, women, and children, and those who showed signs of squeamishness at the prospect of killing women and children were to be severely punished... Jews, Poles, and Russians were subhuman and did not deserve to live (1973, p. 67).

The human lives lost due to the second world war from both military action and war-distributed disease is estimated at over over 60 million (Wright, 1942, p. 245). Germany lost 6.9 million soldiers on the Soviet front, and an estimated 27.5 million Soviet citizens died fighting German troops. In addition, millions of fatalities related to the war occurred, such as the 1.5 million who died of hunger in Leningrad during the conflict. The total number of people who died from war-related hunger and illness alone was estimated at around 12 million.

In Germany, fully half of all adult males were killed or wounded (Freed, 1970). The direct cost of World War II to America alone was estimated at \$263 trillion (the amount is the dollar value of the time; source U.S. Government Statistics). The official American fatality number for World War II was 402,339. Since World War II, humans have fought over 125 wars, including the longest one in U.S. history, Vietnam (Morrow, 1982, p. 88).

The term holocaust usually refers to the Nazi murder of European Jews, but Germany is not the only civilization that has indulged in massive slaughters of its own population (Rabinowitz, 1979). Actually, several major slaughters in history were more massive than the Jewish holocaust, and all these were triggered by communist movements (Azar, 1990).

The Crimes of Communism

Until recently, the four major histories of the Stalinist era were Roy Medvedev's *Let History Judge* (1989), Robert Conquest's *The Great Terror* (1968), Antonov-Ovseyenko's *The Time of Stalin* (1981), and Alexander Solzhenitsyn's *The Gulag Archipelago* (1974). Antonov-Ovseyenko's *The Time of Stalin*, according to Stephen Cohen (1981, p. viii), a professor of Soviet politics at Princeton, is one of the more important recent works on the Communist holocaust. Antonov-Ovseyenko was the "only child of a martyred Soviet founding father to emerge as both a witness and a historian of Stalinism." His father, a noted Bolshevik revolutionist who led the party seizure of the Winter Palace in October of 1917, served in the nascent Soviet government and rose to Commander and political chief of the Red Army. Antonov-Ovseyenko estimated 81 million persons died during the first thirty years of Soviet rule (1981, pp. 210–213).

Although some nations may exaggerate their losses in order to encourage sympathy, or even to justify building a strong military defense, in this case the actual tragedy probably is greater than most estimates because the full effects of a major war never are known until decades after the fighting ends. Wounds sustained during battles often do not result in immediate loss of life, but may well shorten it. Soldiers commonly die from war-injury complications

twenty, thirty, or more years later, such as the man who died almost thirty years after a bullet lodged in his neck during World War II (it could not be removed safely, and slowly shifted, causing his death many years later). This and many other similar war-related fatalities were not counted as such.

The Death-Toll of Communist Revolutions

Modern "communistic" revolutions, according to a 1983 Foreign Affairs Research Institute report, resulted in about 140 million deaths. The report included all premature deaths from execution, man-made famine, imprisonment, deportation, slave labor, and civil and international warfare. The coalition counted 46.2 million Asian, 45 million Soviet, and 3.6 million European victims of Communism from 1917 to 1967, reaching the fairly comprehensive sum of 139,917,700 deaths.

The Chinese communist death toll far exceeds that caused by the Axis war, both before and during the Second World War. Walker (1971, p. 15) estimated as many as 63 million persons died as a result of Chinese Communism from 1927 to date.

Schwartz (1972; 1985) claims that Mao Tse-tung's "Great Cultural Revolution" holocaust alone was responsible for some 29 million deaths and the disruption of the lives of 600 million people. Others concluded that the number was closer to 35 million. Sonam Topgyal (1984, p. 7) estimated that the Chinese murdered 1,278,387 persons during their 33-year rule of Tibet alone. Specifically, 174,138 Tibetans died in prison and labor camps, 156,758 were executed, 432,607 died fighting, 413,151 died of starvation, 92,731 of torture, and 9,002 of suicide. Of the more than 7,000 active monasteries present in the Himalayas before the 1950 Chinese takeover, only six remain.

Other Communist-Produced Holocausts

Dolot (1985) claims the Ukrainian communist holocaust cost 7 million lives. Dr. Schwartz's research foundation claimed that over 2 million persons were killed by the Pol Pot Cambodian government. *Facts on File* (February 20, 1981) quoted a February 5th United Nations human rights panel report which concluded that the five-year-long Pol Pot regime genocide was "without precedent in our century, except for the horror of Naziism." Once the communists took control of the country in April 1975, millions were killed, including entire villages and communes, pregnant women or women who had just given birth, old people, entire families, newborn babies, and even mental patients (February 2, 1979, *Facts On File*).

Hawk (1982, p. 21) places the number massacred from 1975 to 1978 at as high as 3 million. According to Sihanouk (1979, p. 77), Radio Hanoi reported that Pol Pot liquidated 3 million Cambodian men and women. Sihanouk, Cambodia's first head of state after the revolution (he resigned on April 2, 1976), feels this estimate is exaggerated, but agrees that the number was high and that "the remaining five million Khmers were barely holding on after three years of forced labor, hardships of every variety and suffering were unparalleled in all of human history." These "slaves," the author reminds us, were doctors, students, or civil servants. Many of these who fled traveled through mine fields in a desperate attempt to reach the border, but barely one-tenth made it. The rest died, were captured, or were murdered. The elimination of so many competent personnel rendered the nation's industrial and military complex virtually useless.

With War Comes Disease and Famine

One disastrous consequence of war is not only the direct killing, but the spread of disease both among humans and domestic animals (especially cattle) by the soldiers. War commonly causes a major disruption of both food supplies (production and distribution) and the economy, resulting in famines and food shortages. The 1914–18 war caused "appalling mortality from disease ... and spread by the native carrier corps recruited by the British and German forces in connection with the East Africa campaign" (Goldthorpe, 1978, p. 25). In the West alone, the 1918 flu outbreak caused over 40 million deaths. Although Western governments later took vigorous action to deal with the plague, the war caused much of the problem and greatly impeded progress for years.

Famines were sometimes a deliberate ploy by a government to pressure recalcitrants into acquiescing (Dolot, 1985). Antonov-Ovseyenko claims the 1932 Soviet holocaust caused famine "was the only artificially produced famine in history" (1981, p. 64). He concluded that Stalin's forced collectivization, his liquidation of the Kulaks, and forced famine cost close to 22 million lives. In an attempt to summarize the communist holocaust, one of the most extensive studies that had access to the formally top secret Soviet archives produced an estimated death number of about 100 million (Courtois et al., 2000, p. 4).

Since 1980 One in Every Four Nations Was at War

A Washington think-tank study found that forty-five nations—a fourth of the world's countries—were involved in a war during in the last decade. *The Center for Defense In-*

formation's "World at War" report listed forty wars: ten each in Asia, the Middle East and Africa, seven in Latin America, and three in Europe. Most of the bloodiest of these conflicts involved communist takeovers or wars in Cambodia, Indonesia, Afghanistan, Philippines, Vietnam, El Salvador, Guatemala, and Ethiopia with a grand total of about 4.5 million dead (Center for Defense Information, 1998, p. 2).

The Communist conflicts since 1900 add up to a loss of over 200 million lives—almost the population of the United States (the fourth most populous nation today).

More recently, 31 "major armed conflicts" in 27 countries were fought in the world since 1994! According to Sampson (1978), over 25 million persons have been slaughtered in mostly communist wars since 1945—as many fatalities as occurred in both the world wars. Wright estimates that at least 10 percent of deaths in modern civilization can be attributed to war (1942, p. 246). Sampson (1978) estimated that since 1945 not more than twenty-six days existed in which a hot war was not occurring somewhere in the world, and he asserted that most of these were communist inspired. The total *indirect loss* of life from war-related disease and injury is probably another 20 million. An example of the still continuing effects of communism is:

Forty years ago, Cambodia was the most developed and cleanest nation in Asia. Phnom Penh was a showcase city with public services, promenades, and city gardens. Then, in 1970, the country was plunged into [war]... between Marxists and government forces... When the Marxist Khmer Rouge forcibly took control of the nation in 1973, the nation rapidly deteriorated to a Third World wasteland. ...Vast tracts of farmland stand idle. Nearly 4 million uncharted land mines, still hidden in rice paddies, keep agriculture and development at bay. Almost daily, farmers are killed or maimed by the anti-personnel devices that were planted during fighting more than 20 years ago. ... Despite these devastating political and economic problems, it is the HIV/AIDS infection rate that may destroy the people. By the end of this year, health officials expect 40,000 full-blown cases of AIDS in Cambodia. ... Health officials say 250,000 Cambodians are already infected with HIV. The number grows by 100 people per day. When Cambodia's 7,346 "commercial sex workers" (the politically correct term for "prostitute") were surveyed, 43 percent tested positive for HIV. "Commercial sex workers" and their customers account for the spread of nearly all cases of HIV/AIDS in Cambodia (Dabel, 2000 p. 29).

It is clear that the Darwinian and anti-Christian revolutions were two important causal factors of these wars and holocausts that have cost tens of millions of lives, *much* of

our wealth, and have brought abject poverty to the lives of much of the world's masses. Over sixty percent of the world's population now lives in poverty, and about half of these in serious poverty, with 400 million on the edge of starvation. The additional money required to bring the world's population up to an adequate level of food, health, and housing was estimated a few years ago at around 20 billion dollars a year. This huge sum was about what the world spent at the time either for war or the preparation for war every other week, most of which until recently involved communist inspired conflicts. And it now costs over 25 billion dollars annually just to take care of America's war-injured, much of this at Veterans Administration hospitals under government expense.

Putting This in Perspective

It is important to note that other factors aside from Darwinism were important in the development of twentieth-century totalitarianism inspired holocausts and wars. This review focuses only on the influence of Darwinism. Other papers would be required to evaluate the other factors. It is important to stress that many historical factors leading to holocausts and wars predated the growth and development of Darwinism. Some of these factors also played a role in the emergence of Social Darwinism. For example, the work of Kant, Hegel, Comte, and especially those thinkers that were part of the so-called enlightenment with its emphasis on extreme rationalism and the inevitability of "progress," all had an important impact on Western thought prior to Darwin. Darwin was in many ways following in the footsteps of these thinkers. Later, Marx, Nietzsche and others were important leaders whose ideas contributed to Darwinism and served as factors leading to conflict. The so called rationalism movement was also critical, and had such a profound impact upon Western Europe and Christianity in the late 1600s that Samuel Johnson commented that the average Sunday sermon in England was an indictment of the twelve apostles for lying.

Darwinism by *itself* does not inevitably lead to fascism, communism, capitalism, or cold-blooded tyranny. Darwinism was widely accepted in England and the United States—none of which developed totalitarian systems like those in Europe. We must also look to other factors to help understand the development of totalitarianism. For example, Communism was a product not only of Darwinism but also of, the so called enlightenment thinkers, a particular social system, and history itself.

Darwinism was an important step in the process that led to totalitarianism, however, while nationalism and the drive for power and empires were also important. The fierce nationalism and imperialism that so infected Europe during the 18th and 19th centuries also helped to lay

the foundation for, and the acceptance of, a particular form of Darwinism.

Under Lenin and Stalin, the U.S.S.R. became a bloody "evil empire" partly because Russian Communism became materialistic, atheistic, and absolute. Stalin did not starve to death 6 million Ukrainian Kulaks solely because he was a Darwinist. His immediate reason was that the Kulaks resisted his collectivization program. Likewise the confiscation of their grain supplies helped to feed Moscow. Darwinism, though, clearly helped to justify his yearnings for national glory and collectivization, especially by helping to negate the teachings of Christianity.

Expanding national territory has the obvious motivations of power, wealth and glory, but Asimov shows that *even here* Darwinism was important:

the European nations were expanding overseas in Asia, Africa, and the Pacific, and it was somehow taken for granted that it was right for them to do this because the European white man was inherently superior to people of darker skins and should take over as a matter of course. ...This view seemed to be made "scientific" by the works of ... Herbert Spencer, who applied the views of evolution, first elaborated by the English naturalist Charles Robert Darwin, in 1859, to society. ...Spencer coined the phrase "Survival of the fittest" and in 1884 argued, for instance, that people who were unemployable or burdens on society should be allowed to die rather than be made objects of help and charity. To do this, apparently, would weed out unfit individuals and strengthen the race. It was a horrible philosophy that could be used to justify the worst impulses of human beings. A conquering nation could destroy its enemy (as the Americans destroyed the Indians) because it was "more fit," and it could prove it was "more fit" because it destroyed its enemy. Indeed, the exploitation of the rest of humanity by white Europeans could be made to seem a noble gesture—as the superior Whites reached out to help the inferiors on other continents by employing them as servants and allowing them to live on scraps.... There were many in the United States who were affected by the Spenserian philosophy and who ached to have the United States help spread the blessings of imperialism, especially since the "end of the frontier" in 1890 seemed to leave American expansive energies with little to do at home (1977, pp. 89–94).

Another important factor causing holocaust deaths was anti-Semitism which was deeply entrenched in European culture long before Darwin. Pogroms and terrible bigotry were common place, and Hitler found many of his fellow normal "Christian" Germans receptive to his anti-Semitic harangues and legislation partly because Christianity had lost much of its life and influence. Darwin reinforced exist-

ing prejudices against Jews, but was clearly not the only factor.

The loss of Christian influence and the corruption of the church were also critically important. The early Christian church was strongly opposed to war, and consistently supported helping the weak and less powerful (Bainton, 1960; Nuttall, 1971; Marrin, 1971; MacGregor, 1954). The Scriptures clearly stress that we are to “make every effort to do what leads to peace” (Romans 14:19). And I Thess. 5:13–15 commands Christians to “live in peace with each other...help the weak, be patient with everyone. Make sure that nobody pays back wrong for wrong, but always try to be kind to each other.” All of this is in contrast to the communist and totalitarian philosophy, which stresses violent revolution and a dictatorship by the proletariat as the “scientific” solution to human problems.

These scriptures focus on individual personal relationships, and their application clearly is not limited to interpersonal conflicts but applies to intergroup conflicts as well even though theologians generally explain them by referring to the dictum that we only as individuals, are to pursue peace and to love our enemies (Matthew 5:44). It is a truism but worth remembering that had Hitler, Stalin, Marx, and the others not rejected Biblical Christianity in favor of a secular “enlightenment” worldview, they would not have accepted the inhumanity inherent in the Nazi/communist systems, and the hundreds of millions of lives lost in the holocausts reviewed above may never have occurred. But Biblical Christianity has “the last word” on all these atrocities because it holds out the prospect of the resurrection of the dead as seen in Isaiah 26:19: “But your dead will live; their bodies will rise. You who dwell in the dust, wake up and shout for joy; Your dew is like the dew of the morning; the earth will give birth to her dead.”

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Book Review

Handbook: Creation, the Flood and Historical Dating by John G. Read Apocalypse Press.* 2000, 206 pages, \$12.95

[Continued from page 24] (instead of the universally accepted 763) and Sargon's accession during 722–721 that he accepts. He believes (p. 108) that "So, king of Egypt" (2 Ki. 17:4), to whom Hoshea, king of the northern kingdom sent messengers, is Shabako, from the twenty-fifth dynasty, though some say So is the Nile delta city Sais, not the name of a Pharaoh. However, So could not be Shabako who began ruling no earlier than 716 BC; well beyond 724 when Hoshea sought help.

Read presents New Testament chronological data as well (pp. 111–122). On p. 122a mistake calculates that it is 2,000 years from Oct., 1 BC until Oct., AD 2001. Because it is a year from 1 BC until AD 1, that time span is 2,001 years. (He predicted Christ would return during the seventh lunar month of 2001 that has now gone by without Christ's return having occurred.) Misspelled words occur on p. 99 and elsewhere.

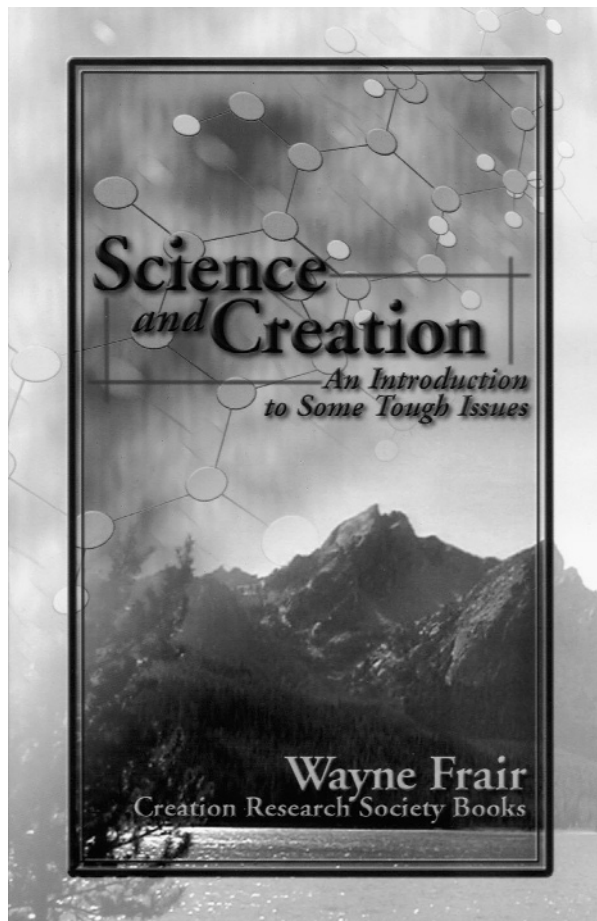
Read is the first creation author I am aware of dealing with an argument against an old earth because of the slowing of the earth's rotation (pp. 145–151). Another new idea he mentions is that the quantity of nitrogen in the sea suggests an age limit of 13,000 years (pp. 191–193). On pp. 175–189, he mentions interesting radiocarbon dating anomalies, such as living Antarctic seals dating to thousands of

years, the Rampart Cave ground sloth dung deposits, discordant Stonehenge tree remains, and a mud turtle from Montezuma Well (AZ) that was dated at 15,000 years before present, though it died only during 1961. Read presents interesting geological, radiometric, and geophysical data that are readily understood by non-specialists. Perhaps some of the ideas are worthy of consideration and further development notwithstanding the problems with his biblical chronology.

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Author Wayne Frair earned undergraduate science degrees from Houghton and Wheaton Colleges. His MA. is in embryology from the University of Massachusetts, and his Ph.D. in biochemical taxonomy is from Rutgers University. He is a fellow of the American Association for the Advancement of Science and a past president of the Creation Research Society. Having spent more than forty years in research and teaching, his current status is Professor Emeritus of Biology at The King's College in New York City.

The Creation Research Society (CRS) was organized in 1963. It encourages research, publication and education in the various fields of science. Since 1964 the CRS has published the *Creation Research Society Quarterly* (CRSQ), which is an interdisciplinary journal covering many creation-science studies. The Society also publishes books dealing with a variety of scientific topics. This *Science and Creation* book is the third in a series of introductory readers.

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Notes from the Panorama of Science

Surface and Subsurface Errors in Anti-Creationist Geology

John Woodmorappe*

Recently, I saw a claim that a seismic line demonstrated that the creationist position was invalid. It was suggested that the seismic data were impossible to interpret within the constraints of the Genesis Flood. We encounter this type of claim frequently and a generic rebuttal is possible and in order. Although specific geological assertions may be of little interest to all CRS members, the underlying error demonstrated in the claim is common to the broad spectrum of anti-creationists—the malignant mistake of positivism. As evidenced by many religious anti-creationists, it even casts its pall over those who proclaim faith in Christ. How many times have we heard the mantra, “Science proves X, therefore the Bible really means X, even though it plainly states Y”?

Positivism, the “Subsurface” Error

The assumption that scientific knowledge is somehow superior to revelation, theology, and philosophy is the hallmark of modern positivism. Its influence is evident in the assertion that some piece of scientific evidence (i.e., a seismic line) can and should dictate both biblical and historical truth. This position, however common in our day, is dead wrong. If we allow this presupposition then we have already lost the war. For, if someone presents a particular piece of evidence to force disbelief in the Bible regarding earth history, and if we cut off that one head, we can rest assured that there will be many more. If we agree with the positivist in his epistemology, the question perpetually remains. What will we do about the next seismic line? The next well? The next outcrop? Science can never provide the finality, a framework or even most of the detail of history, and positivists perpetually drift in a sea of uncertainty in search of truth, from one lonely “factoid” to the next, without satisfaction.

Positivism is also intellectually dishonest. In its proper setting as the epistemology of Naturalism, it is openly antagonistic to biblical truth, while secretly retaining aspects of Christian theology needed to support its pretense at rationality (Reed, 2001). Are Christian positivists less guilty because they do not hide their dependence on a part of the Bible; or are they more, because they are even more inconsistent than Naturalists? We are reminded of the attempts of famous historical figures to take scissors to the Word of God to expunge those parts found objectionable. Scissors do not have to be stainless steel; they can also be composed of faulty exegesis.

Positivists certainly appear to want it both ways. The comforting biblical underpinnings of their assumptions

about reality and knowledge are sometimes not obvious, but their use of those underpinnings to elevate their own scientific conclusions above God’s Word is blatant in our day. A positivist may even affirm belief in the Bible, but we find that it is always on his own warped exegetical terms, with science driving interpretation. The real debate for those of this ilk before they begin talking about seismic lines is the meaning of the words and propositions found in the Bible. Only after they have staked out a clear position (i.e., it is true or it is not true) can intelligent debate be joined. And, of course, upon reflection, we realize that apart from God’s revelation there can be no certainty of any truth and thus, of intelligent debate.

How do we call attention to, and correct this error? One way is to demand greater intellectual consistency. If the Bible is true, then its historical narrative is true, even when counter to the dominant worldview and “expertise” of the day. Its truth is independent of science and overshadows the wisdom of men. If the Bible claims to be God’s word, but is demonstrably untrue in any part, then it is untrustworthy at all points. And if it is not true, then the intellectual foundations of western knowledge and science that rest upon its teachings should be removed (Reed, 2001). Unfortunately, that results in the death of science and knowledge. Modern philosophers have seen this more clearly than scientists, as witnessed by their retreat to existentialism and similar relativistic “isms” of the previous century. Scientists are just getting farther and farther behind the times.

Another symptom of positivism is the confident assumption of the utility of scientific investigation as the means of discovering historical truth. *Science is not history! Natural history is history, not science!* These assertions are absolutely necessary for biblical creationists. Natural history, as history, must answer *historiographic* challenges just as human history must, and derive a *historical* method rather than rest upon that of science. It is naïve to assume that the scientific method is equally effective in the face of historical uncertainty. Where is the repeatability? Where is the direct observation? Where is the control of variables, or even the understanding of what they are? When someone doggedly asserts that the Flood could not have deposited some observed section of sediment, one wonders what data from how many global Floods they possess to support that assertion?

Positivism also inhibits a healthy, reflexive self-criticism that clearly distinguishes between assumption, data, and interpretation. Even a quick scan of most anti-creationist “proofs” demonstrates this failure. You will search in vain for the critics justifying their assumptions. For example, how do they defend uniformitarianism? If based on the Christian assumption of uniformity that is derived from God’s unchanging nature, then they are inconsistent. The doctrine of God’s nature comes from the same Bible that discusses a universal Flood. If his doctrine is not based upon theology, then what? Apart from its theological underpinnings, the assumption of uniformitarianism is wishful thinking, being impossible to demonstrate empirically.

Religious anti-creationists often apply an unusual truth test common among the “intelligentsia”. If they cannot comprehend something, then it must not be true. Their comprehension is itself deemed a truth test. This is arrogant and obviously false. Many Christians repudiate creationism because of their own inability to reconcile scientific data and interpretations of uniformitarian geologists with the Bible. Just because they “do not see” means that it cannot be done? Furthermore, why should creationists be able to explain all natural phenomena off the top of their heads? And if they cannot, somehow their position is invalid?

These questions unveil another defect in positivism—the inability to distinguish between truth based in revelation, theology, philosophy or history from that based in science. Their position is science—thus right. Ours is religion—thus wrong. The result is an amazingly hypocritical double standard. Critics of creationism cite problems resulting from scientific investigation as arguments supposedly removing all credibility from the creationist position. For example, everything from fossils, to thrust faults have at some time rendered the Flood position untenable. Using the same set of rules, creationists could argue that fossil gaps, evidence of catastrophism, problems with dating techniques, etc. render their opponents’ scenarios invalid. What then? Is there no truth in history because both sides are hopelessly incorrect? How can this dilemma be resolved?

When criticized by creationists, their opponents point out that scientific problems facing their pet theories represent new lines of investigation, or problems to be resolved in some new research venture. After all, they say, isn’t that how science works? If so, then it should work the same for creationists. If some anti-creationist trots out a seismic line, outcrop, etc. that presents a ‘problem’ for creationists, then they should apply the same standard. In which case, such evidences are not the death knell of creationism, but are simply opportunities for creationist research.

Beneath the blindfold of positivism, the critics do not even seem to understand the relationship between science and truth within creationism. They seem unable to grasp

that creationists ground the truth of their position in revelation and theology. Our subsequent research projects are not attempts to validate the truth of God’s creation or the Flood; they are merely the pursuit of scientific or historical study, confident that the context is already known. Positivists strip themselves of any legitimate hope of a context by denying the applicability of revelation, philosophy, or theology. They end up playing a pathetic game of scientific “trivial pursuit”, victory residing in a one-upmanship of data.

Religious critics may assert their dependence on the Bible and a relationship with God, but their anti-creationist propositions often reek of positivism, the major “subsurface” error that will prevent them ever finding truth no matter how relentless their search.

“Surface” Errors

Having uncovered the most serious underlying problem in the anti-creationist approach, it is clear from examining their works that their errors are not restricted to faulty presuppositions. There are commonly many errors relating to geological interpretation as well. Since many of these have been well documented in the *Quarterly* and other creationist literature, we will only briefly summarize a few.

A common error is the assertion that the truth of the conceptual geologic column is self evident, based on the data alone. Often, critics will assert that they have seen the “Devonian” or “Cambrian” in drilling or on a seismic line. However, they make the fallacious leap from the physical rock record to the uniformitarian geologic column without any mention of the assumptions that create major distinctions between physical rocks and the conceptual construct. This “bait and switch” tactic is common among uniformitarians. Cuttings and cores do not come out of the hole labeled, “Cretaceous” or “Silurian”. Rocks have no intrinsic historical message—only that imposed by interpretation driven by both data and assumptions.

Critics often scoff at the “time” problem for creationists. Supposedly there is insufficient time for the rocks observed in nature to have formed absent millions of years. However, time is no less a problem for the critics. Take the Grand Canyon, for example. It is a mile deep in places. Take the range of time supposedly represented and divide the thickness of the sediment by the time for a rate. You will find that the answer is 0.000... something inches per year. Ancient rocks are interpreted by modern analogs, right? Obviously, modern environments, similar to those proposed as analogs for the Grand Canyon sedimentation deposit, sediment much faster than that (or scientists would be hard pressed to observe them). At modern rates, the canyon should show many tens of thousands more feet of sediment than it does. For whom is time a problem now?

What about erosion and nondeposition? How about "the dog ate my homework?" The whole point is that inferring time from these features is arguing from a lack of evidence unless we know in advance what time interval is represented. How is that knowledge possible outside the assumption of the conclusion? Geologists use the column to determine what the interval should be, and then triumphantly think they have discovered something when their reasoning returns full cycle.

It is often claimed that the occurrence and distribution of fossils and trace fossils invalidates the Flood position. Often, inherent in these claims are misrepresentations of the Creationist position. For example, a critic might claim that the presence of a burrow in a bed invalidates the Flood. In doing so, he assumes that there must be a stoppage of sedimentation every time a trace fossil is produced. This is incorrect. Note that most trace fossils are not dwelling structures, but simply mottles or burrows. These can form long after an organism has been buried. So long as there is oxygen for respiration within the sediment, and penecontemporaneous cementation prevents excessive pressure on the organism from the overburden, the organisms will continue to burrow. Finally, it will die of asphyxiation. Of course, many sedimentary rocks are virtually barren of trace fossils, probably because there was insufficient penecontemporaneous cementation of the Flood deposits to prevent the organisms from being crushed by the overburden very soon after they were buried in the first place.

Critics assert the impossibility of rapid diagenetic changes in sediments. However, they once again have to

argue from a lack of knowledge. No one observed the deposition or diagenesis of those rocks. Inference from observed modern analogs may be helpful, but creationists assert that the Flood has no modern analog. Many of its processes were unique by definition. Should the fact that I, or anyone else for that matter, cannot explain exactly how those rocks were diagenetically altered during and after the Flood render creationism invalid? Critics think so. They are wrong.

Positivism breeds a consistent error in the anti-creationists. It is expressed by their confusing the physical evidence with their interpretations, as though there was a seamless process that excluded assumptions about reality, knowledge, and history, much less geologic processes. Closer examination reveals that anti-creationist arguments against the Flood are in fact a restatement of their uniformitarian assumptions as uniformitarian interpretations. The data often appear only as a prop in the act. Statements of geologic history are by definition interpretations, and are therefore open to question; whether in doubting their presuppositions, presenting contrary data, or holding alternate hypotheses. Creationism has a valid place in challenging uniformitarianism on all of these fronts and its critics are going to have to learn to respect that right.

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Genetics and the Origin of Similar Features

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For the last fourteen years I have put forward an answer as to the question of why distinct life forms in the past, together with some examples in the present, share features. This idea I called the gene-theme model (Brown, 1987). It states that some of these shared features among unrelated kinds were created by God at the onset and some were produced by way of genetic variation with the kinds, by means of the life form genetic potential. Here I deal with the genetic aspect of the origin of similar features. The question could be asked how fossils and genes can be linked? It is rare indeed for genes to be preserved intact in fossil remains, so how do we know which genes coded for which features of a fossil? My argument is that we do not need to know which genes are involved in producing the parallel similarities.

At one time it was thought that genetics worked by way of one gene, one enzyme, one function, but we now know that there is a far wider set of options than this. There are

numerous examples of what are called pleiotrophic gene effects whereby a single gene causes two or more effects. Berry cites a gene in mice, for example, which plays its part in both body size and eye color. Another mouse gene is involved with both the tail and the alimentary canal (Berry, 1972, p. 47). De Beer cites a gene that plays a role in more than one function (1971, p. 15). In certain fowl, the formation of crest feathers and production of a cerebral hernia, which is an upswelling of the skull, are both connected to the same gene. De Beer also supplies an additional example of pleiotrophy in which fruit flies were born without eyes because of a damaged gene. But after a few generations the eyes returned to normal. On examination, it was found that genes had been re-shuffled such that a different gene was ultimately being involved with eye formation (De Beer, 1971, p. 15).

Monotremes have certain body cells which are very similar to those found in monitor lizards. Also, the monotremes have an organ called the lagenar macula in their inner ears.

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A lagenar macula is otherwise found only in reptiles. The electrophysiological properties and cell components of the lagenar macula in the monotreme, however, are those of a mammal, and are thus part of the creature's own tissue make-up and not really reptilian in character (Brown, 1987a, p. 77). This is an outstanding example wherein a similar organ is formed by different genes in two widely different organisms: monotreme mammals and monitor lizards.

A fossil leaf of a magnolia plant was uncovered in Idaho, and was still both green and wet. From it, a DNA sequence was recovered, and that sequence differed from the same DNA in modern magnolias by only 17 out of the 120 base pairs. This was the particular gene involved in photosynthesis, and is known as *rcbL*. The age of the fossil leaf is assumed to be 20 million years (Rennie, 1990, pp. 14–15). Here is a clear case in which very similar genes are coding for a particular photosynthetic enzyme in both a supposedly ancient fossil and a modern plant.

Evidence has grown to support the view that the genetic make-up evidently involves the nucleus, the cytoplasm, the cell surface, and other coding regions. This genetic system plays the chief role in helping to produce form. The principal evidence that the Creator produced shared features independently in separate life forms can be found primarily by comparing organisms with shared features that are either living at the same time (thus negating any chance of one developing into the other) or in which the time gap between the two is entirely too short, for one to have developed into the other (Brown, 2001, p. 256).

Sometimes organisms with shared features come in the “wrong order” for evolution theory. For example, *Protoavis*, a fossil bird, existed 75 million years before its supposed ancestor, *Archaeopteryx*, and the various dinosaurs viewed to have been the ancestors of *Archaeopteryx* (Brown, 1987b, pp. 143–144). This is quite the reverse of what evolutionists would have predicted.

Another example of an instance wherein shared features support separate and independent origins by creation is when a fossil is so far “away” from the other fossil in “time” that one could not possibly have given rise to the other. Thus *Seymouria* had both reptile-like and amphibian features, but its putative time of existence was 70 million years after the time when reptiles are supposed to have diverged from amphibian. Therefore, *Seymouria* was in the wrong theoretical time period to have had any connection with the supposed lineage of reptiles from amphibian. Thus many reptile-like features found in *Seymouria* were probably created in it, separately from the reptile line or were brought into existence through *Seymouria*'s genetic potential.

A fossilized young individual of a very similar form to *Seymouria* was later discovered and it showed that *Seymouria* was in fact an amphibian (Stahl, 1974, p. 28). Thus any reptile-like features found in *Seymouria* must have

been created in it, separately from the reptile line, or brought into existence through its genetic potential.

I would like to make a comment on the life forms' *genetic potential*. At the top of my origin paper on shared features, I speak about the *monotremes*. I mention that the monitors and the monotremes have some cells and arrangement of those cells that are the same or very similar. This only occurs in the *spiny anteater*, and is not found in the *platypus*. So, either the two were created like they are, or one lost these features and the genetic potential produced something else, or the spiny anteater produced those reptile-like features. We of course do not know for sure, but in two out of the three options the genetic potential could come into play. It only takes a discovery like the relation of *Seymouria* to be discovered without those reptile-like features and questions would of course be raised. The life forms' genetic potential guards against that.

The evidence in this note shows that there are instances, (as in the case of fossil and modern magnolia genes), in which the Creator produced similar features by means of genetic diversification within one kind, after Creation. But there is likewise reason to believe that systems like the lagenar macula in both monotremes and in monitor lizards were produced independently as similar features in widely distinct kinds. All of these data point toward the supreme versatility of the Creator.

Acknowledgments

I thank Paul Stanton and Bobbi Blade for assistance in computer typing. I also thank George Howe for constructive criticism and editorial revisions.

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Letters to the Editor

Hierarchical Approach to Natural History Models

I am writing concerning a note by John K. Reed printed on pages 213–215 of the March 2002 issue of the *Creation Research Society Quarterly* (CRSQ) titled, “Evidence for, Conflict over, and Confidence in Creationist Models of Earth History.” This article contains Mr. Reed’s “Hierarchical Approach to Evidence.” Since he uses this model to judge models or theories of origins, I think it would have been better to call it the, “Hierarchical Approach to Natural History Models.” This, however, is a minor point.

It is true that creationism, especially in the area of geology, is moving away from being scientific toward being philosophical. More and more people are inventing their own models of when and how the rocks of the earth were created. Most of them are naturalistic based on theistic catastrophism where the rock cycle model is assumed to be correct and that the natural processes of volcanism tectonic movement, weathering, erosion, and deposition were used by God to create what we see in and on the earth today? As a result we, the readers of these articles need some way to evaluate them. Reed suggests we use his method.

Reed’s model contains four criteria. Only the one labeled “Formally valid” is subject to testing. The rest are subjective. Since I and perhaps most readers of these models do not have training in logic or philosophy this one also becomes subjective. We say, “That makes sense,” or “Something is fishy.” The problem with Reed’s approach is its subjectivity. Who decides if it affirms or denies the Bible? Whose Biblical Worldview is used? Who decides if it is formally valid or empirically compelling? I would hope it would be the reader of the article, model, or theory in question. If so the approach is as good as any. My fear is that some one with a bone to pick with creationism will assume, since it was written by the present geology editor, that it is the editorial policy of the CRSQ.

The CRSQ is billed as a scientific journal. Science is supposed to be objective. It supposes to use facts (repeat-

able observations, measurements, and experiments) to check the validity of scientific models and/or theories. The secular scientific community will read this and say, “I told you so! Creationists are not scientists, and their theories are not scientific because the Bible becomes the final arbiter.” Creationist science is therefore not science at all but religion and therefore must be kept out of the public schools of our nation.

I would hope that the editor of the CRSQ would write an editorial stating that Reed’s Hierarchical Approach to Evidence is not the editorial policy of the CRSQ. Rather, the note containing it was printed to help CRSQ readers evaluate not only the models and theories published in the CRSQ, but those published in other creationist publications, and those published in other scientific journals as well.

How then should we as scientists evaluate a theoretical system? I taught my students to ask:

Does the theory give or make a good:

1. Explanation of the facts

2. Predictions

Is it:

3. Flexible

4. Functional

5. Simple

6. Plausible

7. Falsifiable or Testable (Does it accommodate the Null hypothesis?)

This method also fails the objectivity test. But it would be more congenial to the scientific community than the Hierarchical Approach. Creationists using this approach could not be accused of being religious.

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Naturalistic Science and Creationism

In answer to Ted Aufdemberge’s letter, no particular note, article or letter to the editor in the *Quarterly* represents editorial policy. Such policy is determined by our Statement of Belief. (This statement can be found below the Order Blank for Past Issues in all issues of the *Quarterly*.)

Allow me to paraphrase the Statement of Belief:

1. Our members are committed to full belief in the Biblical record of creation and early history and to the concept of dynamic special creation as opposed to evolution.

2. We recognize the Bible as the written word of God.
3. We recognize that the Noachian Deluge was a *historical* event.
4. We are an organization of Christians who accept Jesus Christ as our Lord and Savior.
5. We propose to re-evaluate science from the aforementioned viewpoint.

The following statement concerning the age of the earth is in Article IV, Section 2 of the Constitution of the Society:

While publications of the Society are not intended to support any particular chronology, such as Ussher's, they shall be in keeping with creation in a Creation Week as expressed in the Statement of Belief. Since by its Statement of Belief the Society is understood to be opposed to the concept of vast geological ages, its publications shall be consistent with the concept of the creation week in relatively recent time.

The editorial policy is as follows:

Section 1. Criteria for Technical Articles in the *Quarterly*:

- a. Any article in which scientific macroevolution, theistic evolution, progressive creation, or the gap theory are espoused shall be rejected by the Editor.
- b. Any article in which there is an attack on the inerrancy of the Bible or in which questions are raised concerning the historical or scientific truth of the original autographs shall be rejected by the Editor.
- c. Any article in which the account of origins in Genesis is challenged as factual presentation of simple historical truth shall be rejected by the Editor.
- d. Any article in which there is a rejection of the view that all basic types of living things were made by direct creative acts of God during the Creation Week shall be rejected by the Editor.
- e. An article in which any biological changes (other than changes within the original created kinds) are accepted as occurring since the Creation Week shall be rejected by the Editor.
- f. Any article in which the Noachian Flood (as a historical event worldwide in its extent and effect) is attacked shall be rejected by the Editor.
- g. Any article in which there is a challenge against the need of an individual to accept the Lord Jesus Christ as one's personal Savior shall be rejected by the Editor.
- h. Any article in which questions are raised concerning the fall of man into sin shall be rejected by the Editor.

Section 2. Criteria for Other Sections of the *Quarterly*:

- a. The Panorama of Science section in the *Quarterly* shall contain technical notes. These notes are subject to the same editorial criteria as technical articles.
- b. Book Reviews are subject to the same editorial criteria as technical articles.
- c. Letters to the Editor may express any opinion and may be published at the Editor's discretion.
- d. If an article, technical note, or book review contains significant scientific information that would be of value in the *Quarterly* and contains objectionable material not acceptable by the criteria for technical articles, and the author agrees to remove the objectionable material, the article can be considered for publication.

The "Creation Research Society Editorial Policy" was published in the December 1985 *Creation Research Society Quarterly* 22(3):139-140.

John Reed's note does not violate the Statement of Belief of the Society or our editorial policy. Whether one chooses to follow his hierarchical approach is a matter of personal taste of the individual creationist model builder. In comparison the Aufdenberge concept to evaluate a theoretical system does not espouse any of the beliefs of the Society.

We as a Society, are not attempting to appeal to naturalists, but to re-evaluate science from a Biblical perspective. Naturalists and creationists are different in the sense that their fundamental presuppositions are different. Naturalists use philosophy when developing their models and often they are blind to their procedure or they believe that *only* their philosophy constitutes a proper framework for science.

Interested readers are welcome to comment on the issues raised during this exchange.

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Star Formation: Natural or Supernatural — Reply

I fear that Jonathan Henry (CRSQ 38(4):217) has misunderstood some of my comments in previous papers, so I welcome this opportunity to clarify my views. I am not comfortable with the term stellar evolution because of the negative connotations of the word "evolution." However, I do recognize that in the context of stars the word has a different meaning than in the context of biological evolution. For instance, no one suggests that stars change into some other entities, but this is exactly what biological evolution assumes happens to living things. Furthermore, biological

evolution, if it were true, would lead to a gain in information, a process that defies all other natural processes that we observe. Stellar evolution theory claims that stars may change their overall properties, but they still remain stars, precisely what they started out as. Henry makes a connection between cosmic evolution (such as the big bang and stellar evolution) to biological evolution, a point that can be made easily with quotes of astronomers as he has done. However, this is to paint with a broad brush. This reminds me of the debate among creationist about microevolution

and macroevolution. Some creationists want nothing to do with microevolution, fearing that it is some sort of surrender that will lead to the slippery slope. Most creation biologists agree that what is called microevolution indeed occurs, but protest that one cannot extrapolate from microevolution to macroevolution. As with astronomy, creationists often have a problem with the word "evolution" here, so one must very carefully define terms. The term "microevolution" is misleading and should be renamed.

Can stars change their overall structure and hence "evolve?" Given enough time, I think that they can, as I will demonstrate. We use very well understood physics to construct models of stars. These physical principles include hydrostatic and thermal equilibrium, gas laws, and nuclear physics. Even simple relations can be derived from these laws to get estimates of conditions within stars. It is a simple matter to show that the average temperature inside the sun is about 10^7 K (Schwarzschild, 1958). Since this is an average, we can conclude that the core temperature is greater than this, and hence well in the range where thermonuclear reactions will occur. The Sudbury result (MacRobert and Tytell, 2001) of last summer seems to have put to rest the problem with the shortage of observed solar neutrinos. However, even if we ignore that result, we have known for some time that the sun produces enough neutrinos so that at least half the sun's energy must come from nuclear fusion. Over time, the composition of the sun's core must change as a result of these reactions. Assuming that the sun's core started with about 70% hydrogen and 30% helium, and eventually acquires a composition of 100% hydrogen, the mean molecular weight would change from 0.62 to 1.33. This dramatic change in mean molecular weight would alter the structure of the core (via the ideal gas law), with the upshot being that the core would become hotter and denser, and hence would support a gradual increase in the nuclear reaction rate. This is the basis of the early faint sun paradox (Faulkner, 1999). This change would make the sun's external temperature and luminosity gradually increase; in other words, astronomers say that it has "evolved." My point is that given enough time, stars must change their structure and some of their gross properties. I question that there has been sufficient time for this to happen; significant changes in a star like the sun would take billions of years and we know that the universe is only about 6,000 years old. However, this is very different from biological evolution, which is impossible, regardless of how much time is available.

I do not commit the "best in field" fallacy here as Henry asserts. To criticize the heart of stellar evolution theory, one must demonstrate that the physics will not work to produce the sort of change that I just demonstrated. Simply nibbling at the edges, such as denying that nuclear reactions occur in the sun or that we do not really know what

the core composition of the sun is, is not sufficient. The Kamiokande experiment is directional and has confirmed that the sun produces neutrinos, and hence the sun supports some nuclear reactions. Even if we do not know exactly what the composition of the sun's core is, that does not negate the fact that if the core contains any hydrogen, thermonuclear fusion into helium over time will change the composition of the core so that the sun will "evolve." Our objections to this should be based upon good science, not distaste for the result. I challenge Henry to give solid arguments in this matter instead of blowing smoke about the "best in field" fallacy.

As for Henry's critique of my cratering proposal, I think that he has failed to grasp the significance of my use of the words "rapid" and "directed." I am puzzled that he equates my proposal (taking less than a day) with gradual naturalistic accretion that supposedly happened over millions of years. It ought to be obvious that what I propose is a miraculous event. I do not propose that the accretion of the planets on Day Four in any way resembles the gradual, evolutionary process advocated by most astronomers. Furthermore, the earth did not participate in this process as most astronomers think, because it was created three days before the other planets, the sun, and the moon were made. God did not create *ex nihilo* in every creative act. For instance, He used dust to fashion Adam, and Eve was made from the side of Adam. This was creation using material that He had already created *ex nihilo* on Day One. Similarly, we can understand the language of Genesis 1: 11, 20, 24 to mean that living things were fashioned on the Third, Fifth, and Sixth Days from matter that already was created on the First Day (e.g. "let the earth bring forth..."). In like fashion, I propose that on the Fourth Day astronomical bodies were fashioned from material that was created on the First Day. Each of these creative acts happened within one day, so I fail to see how anyone can think that I am suggesting an evolutionary theory.

Henry thought that my recent paper on star formation endorsed the idea of star formation. Re-reading what I wrote in my conclusion, I now see that I could have been more clear in my meaning. When I stated that the current ideas of gas cloud collapse to produce stars were a "very fruitful pursuit for creationists," my intended meaning was that this is a fruitful pursuit for creationists to critique the naturalistic explanation of star formation. I was not suggesting that we creationists solve this problem for evolutionists, for indeed, I do not think that this problem is solvable. However, I think that it is improper to totally rule out from a Biblical perspective the possibility that stars could form today. God created horses during the Creation Week, but new horses are born all the time. This fact does not violate God's declaration that he has ceased creating. Instead, we recognize that only horses can beget horses today. Why cannot stars beget stars to-

day? There is no naturalistic explanation for the first horses or stars.

Let me briefly return to the use of the word “evolution” to describe how stars may change over time. At ICR this past summer, Keith Davies and I discussed replacing this word. We decided that we like the word “entropé,” and I hereby offer this instead. Stellar entroping better captures the fact that all changes in stars, whether hypothetical or observed, are ones that are subject to the second law of thermodynamics. I hope that this term will find favor among creationists.

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Danny R. Faulkner

Statistics and Death Rates

As much as I appreciate Dr. Mastropaolo's critiques of Darwinian fundamentalism, I must express skepticism regarding several points he makes in his article “Evolution is Lethal Antiscience” (CRSQ 38:151–158). Data often have different interpretations, and in my humble opinion sensational interpretations should not be preferred where more sober interpretations could equally well explain the same information.

In his article Mastropaolo documents (p. 155) the rapid increase in medically reported genetic disorders. Graphing the number of reported disorders from 1966–1999 he produces a curve that, when extrapolated, indicates “permanent genetic extinction in this century.” May I suggest a less extreme conclusion is in order? Dr. Mastropaolo interpreted the data as if it were a count of *total existing* genetic disorders at each point in time. But the graph is a count of disorders *observed and documented* by medical researchers at each point in time. These are two very different things.

Prior to modern medical research and modern genetics the number of known genetic disorders was essentially zero, but that would not be the same as saying they did not exist. I would interpret the genetic disorder data to indicate that we are currently in a phase of discovery. After the preponderance of genetic disorders are discovered the rate of new discoveries will decline and level off. Based on the data Dr. Mastropaolo presented no real conclusion can be made about how quickly new genetic disorders are actually arising in the human genome, because no distinction is made between truly new genetic disorders and pre-existing disorders that have only recently been discovered. It would be rash to assume that “imminent human extinction” is at hand as long as this uncertainty remains.

An analogy could be made to the discovery of mountain peaks by European explorers. Western surveyors in the 15th–19th centuries went through a period of new discoveries in which the total number of known mountains on earth rapidly grew. Would this justify an interpretation that mountains were sprouting up increasingly rapidly and

would continue to do so *ad infinitum*? Of course not. New mountains might indeed be appearing in this period (due to volcanism) but most of the additional count would be due to pre-existing mountains being discovered, not due to brand new mountains. Eventually virtually all mountains on earth would be documented and the rate of discovery would drop off to match the rate of new mountain formation.

My second area of disagreement concerns the data indicating that infant deaths due to birth defects are increasing as a proportion of all infant deaths (pp. 156–157). Mastropaolo regards this as evidence for increasing prevalence of genetic defects in human infants. He states (p. 156) “the trend in spite of medical advances is an exponential increase in fatal birth defects.” He goes so far as to assert that there will be “100% infant deaths from birth defects by 2085.”

Actually, it is *because* of medical advances that an increasing proportion of infant deaths are due to birth defects. A large proportion of infant deaths in the past were caused by diseases that have been largely eradicated by modern medicine. As the proportion of disease-caused deaths has declined the proportion of deaths due to other causes automatically rises. The result is a dramatically lower overall infant death rate (from several hundred deaths per thousand to less than ten deaths per thousand live births over the past few centuries). The data Mastropaolo presented does not allow us to conclude whether or not birth defects are growing or declining in severity or frequency. To answer this we would need a direct measure of the frequency of birth defects, not their proportion to other causes of death while the death rate itself is declining.

This type of misinterpretation is unfortunately common in our society. I recall my father (a recent creationist and Ph.D. kinesiologist like Dr. Mastropaolo) lamenting panicky news reports that asserted that cancer rates were growing and threatening human health. A professor who teaches health classes, he explained that what is actually

happening is that we are curing many other once-lethal conditions. But humans all eventually die of *something*, and so what remains incurable (typically cancer and heart disease) ends up taking a greater and greater toll even as human longevity increases. A man dying today of cancer at age eighty who a century ago would have died first of influenza at sixty is not evidence of increasing prevalence of cancer but of improved medical care.

In disputing these particular interpretations of the data I do not mean to dispute the fact of genome degeneration in empirical evolutionary biology. Studies of beneficial genetic mutations such as in Spetner (1997) conclusively show that life is in a devolutionary pattern that contradicts the central dogma of the Darwinian fundamentalists, that

life evolves due to innovative mutations that mimic intelligent design. There are many excellent points made in Dr. Mastropaolo's article and it would be a shame to have a Darwinian fundamentalist dismiss them and continue to fight many facts of science because of a few overly sensationalistic interpretations of data.

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Eric Blievernicht

Statistics and Death Rates — Reply

In his comments on "Evolution Is Lethal Antiscience" (CRSQ 38: 151-158), Mr. Blievernicht states that the medically documented genetic disorders continue to rise exponentially because the medical community has been in a continual state of discovery for the past 35 years. He argues that once physicians surmount their naivete, then new genetic disorders are bound to decline and level off. At the end he argues that life is indeed in a devolutionary pattern, which is the thesis of the paper that he argues against. If indeed life is devolving, then newly discovered genetic disorders will increase as projected. At extinction we can expect a decline and leveling off at zero. Until then, these new disorders signal not only the rate of genetic unraveling but the fact that they actually have entered the population of disorders and are directly interacting with the other disorders to accelerate extinction.

It is well known that genetic disorders strike earlier in subsequent generations. A mother developing the inherited form of breast cancer at age 76 finds her daughter developing it at age 66. This points to one of the mechanisms by which genetic disorders accelerate and eventually threaten the newborn. Two years ago, it was found that 71.5 percent of children admitted to hospitals had an underlying disorder with a significant genetic component. Many of these children will have children with earlier and likely more severe manifestations of their genetic disorders. Besides the evidence in the article, such data confirm accelerating devolution and contradict the argument that genetic disorders are bound to decline and level off.

Mr. Blievernicht argues that medical advances have decreased infant death rates and that could explain the rise in the proportion of deaths from birth defects. That assumes that physicians are applying themselves only to causes of death not related to birth defects. This is known

to be false. Afflicted with a birth defect well known for many years, Down syndrome babies usually die soon after birth from their cardiac abnormalities. Currently, surgical teams operate as soon as the child is born and have thereby prevented deaths that otherwise would have been counted as birth defect fatalities. Down syndrome fatalities at birth are on the decline. Yet in spite of these medical advances, birth defect fatalities continue to increase exponentially.

We also know that prenatal genetic testing is increasing because genetic disorders are rising and in response more tests have been devised and are being made available. The purpose is not only to forewarn the parents that an unborn has genetic disorders but also to provide the opportunity for an abortion, which medical personnel generally encourage especially if they are associated with the abortion industry. Presently, no statistics are kept. Here then is a black hole, probably ever widening, that intercepts birth defect fatalities yet birth defect fatalities continue to increase exponentially.

The article gave the Leakey reference which documented on one ridge in the Andean foothills the discovery of 90 new species of plants that were brought to extinction eight years later by farming. That was fortuitous discovery before extinction. How many unknown species have been destroyed before any survey was done is unknown. Mr. Blievernicht ought to use life forms in the mountain analogy, which unlike the peaks can be extinguished in an instant of time without anyone knowing they were ever there.

As a lad, I played on 42 acres in the Appalachian foothills and recently went back. About 90% of it was unrecognizable. There was not one meadow or brook or spring or sound at night. From memory, I counted 91 species of plants and animals that had disappeared and that in-

cluded the bellwether frogs and newts. That was my reality check that the extinction of humans is consistent with and related to the extinction of the rest of the biosphere upon which we are completely dependent for survival.

Mr. Blievernicht opines that the article is overly sensationalistic. With 30,000 extinctions per year in the rest of the biosphere, 120,000 times normal, a more realistic opinion may be that Mr. Blievernicht is in a state of denial. Considering that extinctions are forever, denial may be folly more extravagant than letting the facts speak for themselves unsuppressed.

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Joseph Mastropaolo

The Trap of Naturalist Nomenclature

The problem of a young universe while distant stars may be billions of light years away hinges on the fact that we are trying to measure pre-fall conditions with post-fall science. We allow ourselves to be limited by Lyell's concept, "The present is the key to the past," when we use naturalist nomenclature that is tied to post-fall conditions such as describing a so-called geological column in terms of periods rather than ecological zones, and describing astronomical distances in terms of light years rather than traditionally standard units of measurement.

The problem of large astronomical distances existing in a young universe becomes a non-problem if one is willing to accept the fact that God "spoke, and it was done; He commanded, and it stood fast." (Psalm 33:9) When God said, "Let there be light," (Genesis 1:3) there suddenly was light throughout the entire, pre-fall universe, light which had an astronomically fast speed that did not start slowing down until after the fall when God placed His curse on the entire creation as the promised consequence of Adam's sin (Genesis 2:17, 3:17 and Romans 8:18-23), and degenerative changes set in to affect all natural processes.

The light year, a measure of distance, is about as useful as a rubber ruler. Its length depends upon the speed of light: the faster the speed of light, the longer the light year; the slower the speed of light, the shorter the light year. (Shades of Relativity!) Referring to the work of Trevor Norman and Barry Setterfield, M. E. J. Cheury de Bray, and V. S. Troitskii, Walt Brown demonstrates that the speed of light has slowed down asymptotically (Brown, 2001, pp. 232, 236); hence it could have been infinitely faster when

God spoke light into existence. Thus, the light year could have been infinitely longer, requiring fewer of them to measure the distance between us and the outer reaches of the universe—even as few of them as 6,000 which agrees with Biblical chronology.

We have been trapped into assuming that the speed of light is fixed and, thus, that the light year is a fixed measure of distance, the distance that light travels in a year at today's speed, long after the fall. Instead, the light year is nothing more than a useless, variable measure of distance, employed by naturalists to mislead us into questioning the scientific accuracy of Scripture. What a wily way for Satan to undermine the Christian Faith! Let us, therefore, return to traditionally standard, truly fixed units to measure distances like miles (Mi), or kilometers (Km), or astronomical units (AU), even if we have to add $\times 10$ to the n th power to the figure.

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Speculation Concerning God's "Big Bang"

According to current cosmological timetables, the universe took 10 to 15 billion years to undergo the Big Bang

expansion from nothing to its present condition. But I propose that the bubble of space/time/matter/energy that we

call the universe expanded from nothing to its present size during the six-day creation recorded in Genesis 1. At least twelve times in the O.T. God is portrayed as “stretching out” or “spreading” the heavens (Job 9:8, 37:18; Psalm 104: 2; Isaiah 40:22, 42:5, 44:24, 45:12, 51:13; Jeremiah 6:4, 10: 12, 51:15; Zechariah 12:1). So what existed prior to Genesis 1:1? Nothing but God, the infinite, personal Spirit. Therefore, the bubble of space-time was stretched out from nothing to its present size extremely rapidly. Considering that velocity = distance/time, let the distance traveled by the outer reaches of the universe be 10 billion light years, and the time for the expansion be six days or about 1/60 year. Then the velocity at which the outer regions of our universe had to travel was at least $v = 10 \text{ billion light years} \div 1/60 \text{ year} = 600 \text{ billion light years per year}$. This is 600 billion times c , the current speed of light (300 km/sec). It seems reasonable to assume that in order for the universe to be a *universe*, with the parts connected together, the speed of light and of gravity waves had to be up to 600 billion times the present value. Then God slowed light down to its current value, c .

During this period of stretching out space-time, God also was putting into place the entire system of natural laws that we know today. He also was creating much energy during this creative expansion. Therefore, physical laws such as conservation of energy, and the system of physical constants were not operative during the expansion in the manner in which they now operate. Therefore we cannot be sure what the effects would be on the radiation that now is reaching us from the far reaches of space.

Another line of thought has to do with the end of this age. If it took God 10 billion years to stretch out the heavens, then it might take Him roughly the same amount of time to collapse it. However, in 2 Peter 3:10–13 we are told

that God is going to collapse and dissolve the heavens and the earth, with extreme rapidity. The Greek word *ροζηδον* translated in verse 10 as “with a great noise” suggests something that happens with a rush and great power. And in Revelation 20:11 we have, “Then I saw a great white throne and Him who sat on it, from whose face the earth and the heaven fled away. And there was found no place for them.” So must we believe that before God can judge the multitude of ungodly, rebellious sinners, He must wait for 10 billion years for this sin-cursed universe to collapse and be dissolved? Nothing could be more absurd, and the language of Revelation 20 gives no hint of any appreciable delay between the wrapping up of earthly affairs and the final Judgment Day.

Now let us return to our original subject, the length of time that God took to create the universe. If God is going to collapse and destroy the sin-cursed heavens and earth suddenly, in a rush, very rapidly, why should we think that he needed ten billion years to spread it out in the beginning? The language of Genesis 1, 2 Peter 3, and Revelation 20 offers not the slightest hint that either the starting up of God’s created universe or its shutting down involves an extended period of time. In view of the tight logic of this argument that is grounded solidly in the pertinent scriptural evidence, why is it that some evangelical church denominations have ruled acceptable the teaching and preaching of the great-age chronology in their churches? Why is it that faculty members in their seminaries and colleges are allowed to promote the great-age chronology?

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Further Reflections on the CCC Model

A recent letter in the *CRSQ* (Lain, 2001) raises yet more questions regarding the Creation/Curse/Catastrophe (CCC) Model. Several issues arise in the letter, but only a few will be addressed that are troubling in light of recent research.

The CCC Model differs in several areas of its fundamental structure from other models of Earth history. This model proposes that rock strata were derived not only from the Flood, but also from two other sources and time frames: (1) processes involved within the Creation Week and (2) as a result of the curse on mankind (Lain, p. 165). Ecosystems normally thought to have existed within standard geologic time units (Periods) are said to be contemporaneous with similar ecosystems existing in other areas. Each of these ecosystems is necessarily linked in a progres-

sive vertical time succession with the subsequent advancements made within each system. The CCC Model attempts to integrate vertical changes in the progressive ecosystems by direct correlation with biostratigraphical rock units (Lain, p. 167).

Although the CCC Model is not based on deep time, its functionality must necessarily parallel the uniformitarian concept of great amounts of time being necessary for deposition and fossilization of progressive and successive ecosystems within the rock record. By stating that the similar ecosystems are contemporaneous does not exclude the time frames needed for various ecosystems to reach global maturation and become preserved as varying “ages” within the stratigraphic record. Without using uniformitarian beliefs of the time involved in depositional and petrification

processes, the CCC Model would appear to predict that multiple high-energy catastrophic events would have occurred at varying times over most, if not all land surfaces. Such a dangerous, chaotic, and unsettled Earth would seem too great a problem for survival of developing ecosystems.

A Silent Explosion

The author associates the increasing abundance of stromatolites from the lower to the upper Precambrian as resulting from their proliferation after creation. Similarly, the interpretation of the Cambrian explosion is a function of the fruitful multiplication of marine life after Day 5 of the Creation Week (Lain, p.167).

The author indicates the various forms of marine life that were buried in increasing numbers with decreasing depth in rock strata, is simply indicative of increasing populations of living things. This would seem to mean that the CCC Model supports generations of life-forms that are buried by slowly accumulating sediment over undetermined but necessarily extensive time frames. Without multiple catastrophes occurring over the Earth, much time would be necessary to accommodate the proliferating populations of organisms found in increasingly higher rock strata. This scenario would have been in a pre-Flood context operating under uniform conditions. Unfortunately, this idea has its roots in the global uniformitarian stratigraphic column that provides the foundation for evolutionary doctrine.

Telltale Stromatolites Tell Tales

Stromatolites are fossils of fragile blue-green algae sometimes found in "Precambrian" strata. In one location might be found a scant population of these fossils in "lower Precambrian" rocks. Far away, in another location of "middle Precambrian" rocks, one might discover a slightly greater population of these fossils. Investigating an "upper Precambrian" deposit far removed from the other two might yield an even greater density of stromatolites. The obvious interpretation is that the algae grew in numbers over time. However, to make this assertion, one has to link the non-physically connected deposits of "Precambrian" strata purely by the process of biostratigraphical correlation. In fact, a biostratigraphic rock unit is defined only by its fossil content and without regard to lithology, physical location, or characteristics of the rock unit (American Geological Institute, 1962, p. 51). In other words, rocks of a similar biostratigraphic time unit can be various sedimentary types such as sandstone, limestone, shales, etc. and be continents apart. This interpretation is subjective and depends strictly on the evolutionary concept of uniformitarian processes having occurred over much time.

Thus, the assignment of the "ages" of a particular rock stratum is derived from evolution-based assumptions.

The voluminous evidence of well-preserved fossils of various hard and soft-bodied marine life speaks of quick burial by rapid sedimentation (Whitcomb and Morris, 1961, pp.154–169). This process prevents deterioration of the organism by removing it from contact with the atmosphere, microbes, and predators, thus facilitating the petrification process. To accomplish the worldwide task of burying billions of life-forms, a single event of great magnitude provides the better explanation from both a Biblical and scientific viewpoint. The global Flood is the only mechanism that could supply the necessary energy to accomplish the prolific evidences now observed in the rock record. One Flood interpretation for the varying local populations of stromatolites is that these algal mounds were rapidly buried in situ or during transport, with some areas already having or receiving a greater density of stromatolites than other areas.

Flood Facilitates Fossil Formation

In defending the idea that not all of the fossil record was caused by the Flood, the author looks to a uniformitarian geology reference (Dunbar and Wagge, 1969, pp. 330–331) for support. He states, "Raindrops, mudcracks and dinosaur tracks could never had (sic) withstood the violent, destructive forces of nature brought about by the hand of God" (Lain, p. 167). Apparently, the CCC Model holds that these fossil features could not have survived the effects of the Flood so they must have been formed through uniform processes as described in the geology reference.

Actually, the Flood would have provided an excellent mechanism for preservation of these features. Rain impacts, mudcracks, footprints, and ripple marks are very fragile and easily modified or destroyed before a petrification process can begin. Their very existence in the fossil record speaks of rapid processes in effect to preserve them from destruction.

As the Floodwater increased on the Earth, land creatures would have sought the temporary safety of higher ground just ahead of the advancing water. As Flood processes produced great quantities of carbonate material and sand, these would have been deposited across great areas of the land/sea interface through tidal forces, wave action, and tsunami events. Carbonate material or lime mud would have been unlithified for a short period of time allowing creatures, raindrops, and ripple marks to leave their prints. The lime mud would have hardened sufficiently within hours to preserve the prints from being erased by subsequent water and sediment interaction. The same would have been true of such prints made in unlithified sands. Cementing agents (calcium carbonate, siderite, and quartz) in solution in the Floodwater could have also

caused rapid lithification of the sand particles (Akridge and Froede, 2000), resulting in excellent fossil tracks and impressions now observed in sandstone.

Mud is More than It Is Cracked Up to Be

The uniformitarian geology book referred to by the author described mudcracks forming by the drying out of mud. Mudcracks are generally thought to occur under subaerial conditions through a desiccation process. Supposedly, desiccated impressions left by animals, raindrops, ripple marks, and mudcracks in soft mud remained during a dry season until later covered by sedimentation. The reference did not mention the process called syneresis, a mechanism that causes mudcracks to form underwater (Froede, 1994). Mudcracks are possible in subaerial and subaqueous conditions or even a combination of each process (Oard, 1994a). For mudcracks to be present in strata containing prints is not a problem in Flood geology as this is predicted based on current research.

Particular concern is expressed about rain prints not being able to survive the effects of the Flood (Lain, p.167). In certain stages of the Flood after the intense rainfall had occurred, subterranean reservoirs would still have been adding colossal volumes of water necessary to inundate the entire Earth with the advancing seas. During this time, light sprinkles of rain would have left their prints in rapidly lithifying surficial lime mud or loose sand containing cementing agents. Before a hard rain or other destructive event would have occurred, the rain prints were already "set" in the rapidly hardening surface of the muds and sands. Perhaps it was during this time of chemical activity in the diagenetic process that mudcracks sometimes formed on the surfaces of rapidly lithifying strata in both subaerial and subaqueous conditions.

Precambrian and Pre-Flood Glaciation?

The CCC Model presupposes that not all the fossil record was a result of the Flood, but portions of it support the account of Creation Week while other portions are the result of the curse on mankind (Lain, p.165). A difficulty in understanding this concept is to ascertain what strata were deposited during which time frame, the creation week, the curse on mankind, or the Flood. The author freely admits, "We may not be able at the present to point to a specific example and say this is proof of the pre-Flood curse." He goes on to say that widespread glaciation and accompanying ice ages in the Precambrian and Ordovician time frames may have resulted from the curse. He again cites uniformitarian references to point to Precambrian glaciation and an Ordovician ice age (Lain, p.168).

The timing and extent of the Precambrian glaciation cited by the author would seem to contradict parts of the

CCC Model. In this reference, the size of the Precambrian ice sheet suggested by the Gowganda tillite is widespread rather than a montane glaciation. Dunbar, (1955, pp.107, 121) indicates that Gowganda tillite is found as much as 500 to 600 feet thick extending over an area 1,000 miles in diameter from west to east over the Canadian Shield. Because of this purported continental ice sheet called the Huronian glaciation, cold weather across Canada at that time would be understood.

After this supposed glaciation before the Flood, the CCC Model must predict that a large part of Canada would have shifted from a cold, glacial period to a warm, tropical environment conducive to habitation by a huge population of dinosaurs, other reptiles, and various flora. The presence of abundant dinosaur remains in Alberta, other parts of Canada, and even Alaska strongly suggests that a tropical environment once existed there. Such a great shift from a glacial to a tropical environment and the time necessary to establish countless herds of large reptiles, other animals, and forests of warm weather vegetation would appear difficult to defend in a pre-Flood context. In contrast, Oard (1990, pp.135–166) offers evidences of a one-time single dynamic ice age occurring in a post-Flood time frame.

From my own experiences, I have seen a hadrosaur mandible imprinted by a fossil fern that was found in the dinosaur graveyards of Alberta. In hiking and driving about the Red Deer River badlands of Alberta, my wife and I saw thousands of square miles of water-deposited volcanic ash hundreds of feet thick, containing countless fragmented dinosaur remains and petrified wood components. The flora and fauna spoke of a previous tropical environment. The layered, water-deposited bentonite, including the animal and plant fossils, indicated rapid, catastrophic emplacement by hydraulic and volcanic activities.

Another interpretation of supposed glacial action would be by other agencies that leave the same evidences as ice. Tillites and striated rock are said to be the general indicators of action by ice. Turbidity currents and volcanic action could produce the conglomerates and striations on rock surfaces that are associated with glacial activity. With no prior glacial activity having occurred at all, the global Deluge could have produced the same physical evidences normally associated with ice action (Oard, 1994b; Whitcomb and Morris, 1961, pp. 245–249). I have seen striated rock near Spirit Lake (Washington) that was the result of the giant water wave washing abrasives over the previously existing volcanic rock during the 1980 Mt. St. Helens eruption.

The CCC Model apparently allows for glaciation and pre-Flood regions of cold weather. However, fossils found around the world and throughout the whole geologic column attest to a warm to moderate climate with abundant water for the sustenance of animals and plants. This is true

even in the Arctic and Antarctic regions (Whitcomb and Morris, pp. 123, 240–241, 243n). Many geologic evidences testify of the Earth's warm antediluvian climate (Whitcomb and Morris, pp. 243–258).

Conclusion

I am thankful for all the people working to define Earth's history from both a sound Biblical and scientific foundation. As with any worthwhile effort, each researcher will confront crossroads on the path to achieving that goal. Researchers must constantly question their present direction and scrutinize the efficacy of their actions. Are the data sound? Are the data both Biblically and scientifically in sync?

I believe many applicable questions, including those already raised, need to be credibly answered for the CCC Model to gain wide acceptance. The answers should reflect Biblical and scientific soundness and offer no defense based on the global uniformitarian stratigraphic column or any hypothesis derived from evolutionary doctrine. Some of these questions for consideration by supporters of the CCC Model are as follows:

1. How can thick deposits (even miles thick) of sedimentary material containing fossilized animals and plants and covering much of the present land surfaces be explained in a pre-Flood context?
2. How can a "Cretaceous" sedimentary stratum in Alabama be age-correlated with a "Cretaceous" stratum in England without using the principles of evolution-based biostratigraphy?
3. Why do fossils of animals and plants from over the globe demonstrate their having lived in warm to moderate climatic conditions?
4. How is the Flood boundary both locally and globally differentiated from strata deposited during the events of Creation Week and the curse on mankind?

5. Does the presence of fossils in rock strata deposited during Creation Week conflict with the Scriptural teaching of no death existing before the introduction of sin?
6. What was the mechanism for the origin of continental glaciation in the pre-Flood world?
7. Why are modern examples of widespread catastrophic activity not observed?

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Book Review

Strange Creations: Aberrant Ideas of Human Origins from Ancient Astronauts to Aquatic Apes
by Donna Kossy

Feral House, Los Angeles, CA. 2001, 253 pages, \$17

This is an interesting book surveying extraterrestrial origins, evolution, eugenics, the aquatic ape theory, Urantia and other strange ideas about human origins. It has 80 illustrations and photographs of the many colorful personalities, books and promotionals that are associated with these

ideas. What is strangest perhaps is the inclusion of creationism in this list of "Strange Creations." And this was admitted by Kossy in her Introduction when she wrote "although creationism is a traditional way of looking at mankind [*i.e.*, *Not strange!*], I treat it as an aberrant anthro-

pology for the purposes of this book. . .” (p. x) Her bias may also be seen in a comment she made in reference to a meeting of the Heaven’s Gate UFO cult which she attended in 1994. She stated that much of what the cultist said seemed credible until

...one of them added that “He Who Was Called Jesus,” was the last representative from the next level to come here, 2,000 years ago. Up until this point, all of their terminology and ideas were entirely new to me. My unfamiliarity with their jargon was one reason why I thought they might really be emissaries from another world—how could these rational-seeming people make this stuff up? But as soon as I heard the name “Jesus,” I sighed heavily, “So this is just another Judeo-Christian belief system,” I thought, and the spell was broken. . . . After I’d returned to my normal, skeptical self the meeting became a lot less fun (p. 233).

I will focus on Kossy’s coverage of creationism, although she devoted only 40 pages to it, since she attributed many of the aberrant ideas listed in her book as being possibly due to some biblical and creationist influences. A refrain repeated throughout her book is that the founders of many of these aberrant ideas quoted (misquoted would be more accurate) passages from the Bible and believed in the idea of racial superiority, whether as a result of extraterrestrial breeding activities or by some other means of evolution. But the ideas of racial superiority, extra-terrestrial space beings, and evolution are all foreign to the Scriptures. The fallacy in giving a detailed reporting of various cults and then linking creationism in such a list is obviously to impugn guilt by association.

Kossy makes a number of unwarranted comments about creationism. For example, she writes that “Creationists. . . all appeal to biblical authority for answers about the origins of the world” (p. 156). This fails to recognize those Progressive Creationists (e.g., Pattle Pun), non-Christian theists (e.g., Fred Hoyle), and others who seem to appeal largely to the record of nature for answers on the “how” of origins and turn to other sources such as theology for insights on the “why” of creation. Another example is her statement that “Scholars agree that Babylonian, Sumerian, and Egyptian myths all had a strong influence on the Bible, especially the book of Genesis, which may be read as a collection of not necessarily consistent Middle Eastern creation myths” (p. 158). Her statement ought to have been qualified by saying that it is primarily liberal “scholars” who hold to such a view. Conservative biblical archaeologists such as Dr. Bryant Woods and many others would certainly disagree with her. The counter-argument that the Biblical account of creation may have influenced these other creation accounts (i.e., these other creation accounts

are but perversions of an original account) rather than the other way around, is not even mentioned.

Other examples of unsubstantiated statements are the naïve but oft-repeated charge that Genesis 1 and 2 report two different, contradictory creation accounts (p. 159) and also that John T. Scopes of the much heralded 1925 “Monkey Trial” was a biology teacher (p. 169) [Scopes was actually a coach and substitute teacher]. On page 177, Kossy makes an astounding claim, in order to convey how incredulous the biblical story of the Flood seemed to her, that at least a “billion people thus lived at the time of the flood. . .” (p. 177). Kossy, however, did not cite her source for this information. The references I consulted all seem to indicate that the world at about the time of the Noahic Flood would have had only a couple of million people [Westing, p. 523] and that the world did not reach a population of a billion until after A.D. 1800 [Diagram Group, p. 221].

A weakness in the coverage of Scientific Creationism is that it consists mostly of reports about the early days of the creationist movement with few references from recent creationist writings. Such major contributors to the “religion & science movement” as the American Scientific Affiliation, the Templeton Foundation, and the more recent Intelligent Design movement are not even mentioned. In short, the author fails to establish a reasonable rationale for casting Scientific Creationism as an “aberrant” idea and fails to recognize the contributions of “major players” in this field. In an otherwise well-written book, this is a glaring weakness.

The book lists helpful endnotes after each chapter but lacks an index. Despite these and the other shortcomings mentioned, I found this book to be very informative and enjoyable to read. It provides many little known facts about aberrant ideas which most people are unaware of.

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CRSQ: *Creation Research Society Quarterly*. [for multiple *Quarterly* references]

Cockman, Joneen. 1988. Collecting plants for the Creation Research Society Herbarium. CRSQ 24:187–193.

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Book review headings, like references, have a particular style which should be followed. This issue of the *Quarterly* will provide examples.

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Creation Research Society

History—The Creation Research Society was organized in 1963, with Dr. Walter E. Lammerts as first president and editor of a quarterly publication. Initially started as an informal committee of 10 scientists, it has grown rapidly, evidently filling a need for an association devoted to research and publication in the field of scientific creation, with a current membership of over 600 voting members (graduate degrees in science) and about 1000 non-voting members. The *Creation Research Society Quarterly* has been gradually enlarged and improved and now is recognized as the outstanding publication in the field. In 1996 the CRSQ was joined by the newsletter *Creation Matters* as a source of information of interest to creationists.

Activities—The society is solely a research and publication society. It does not hold meetings or engage in other promotional activities, and has no affiliation with any other scientific or religious organizations. Its members conduct research on problems related to its purposes, and a research fund is maintained to assist in such projects. Contributions to the research fund for these purposes are tax deductible. As part of its vigorous research and field study programs, the Society operates The Van Andel Creation Research Center in Chino Valley, Arizona.

Membership—Voting membership is limited to scientists who have at least an earned graduate degree in a natural or applied science and subscribe to the Statement of Belief. Sustaining membership is available for those who do not meet the academic criterion for voting membership, but do subscribe to the Statement of Belief.

Statement of Belief—Members of the Creation Research Society, which include research scientists representing various fields of scientific inquiry, are committed to full belief in the Biblical record of creation and early history, and thus to a concept of dynamic special creation (as opposed to evolution) both of the universe and the earth with its complexity of living forms. We propose to re-evaluate science from this viewpoint, and since 1964 have published a quarterly of research articles in this field. All members of the Society subscribe to the following statement of belief:

1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.

2. All basic types of living things, including humans, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created kinds.

3. The Great Flood described in Genesis, commonly referred to as the Noachian Flood, was a historical event worldwide in its extent and effect.

4. We are an organization of Christian men and women of science who accept Jesus Christ as our Lord and Savior. The act of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Savior for all people. Therefore, salvation can come only through accepting Jesus Christ as our Savior.