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The fear of the Lord is the beginning of wisdom. Psalm 111:10

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THE JOURNAL OF THE AMERICAN SCIENTIFIC AFFILIATION

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- EDITORIAL -

A Message from the President

Past Performance

The success of the A. S. A. in large part is the stature of a man. Mr. Everest was president from the beginning. His friendly and forceful personality lead the founders to build on a stable foundation of policies and plans. His initiative, aided by able authors and committees has produced a modern tribute to the Christian Doctrine, our MODERN SCIENCE AND CHRISTIAN FAITH. His steady pressure has put across the program of the A. S. A. To him goes our thanks and the credit for much of its progress since its founding in 1941. It is with regret that I see him leave the presidency.

Program for the Present

The good work must continue. The JOURNAL takes on an improved printing with this issue. Your editor and his associates of the executive council will do all they can to keep the JOURNAL a forceful influence among thinking people.

Plans for the Future

The council is considering additional means for extending the usefulness of the A. S. A. Will each of you write to one of us the suggestions you have for the further conduct of our affiliation? We also wish to add to our membership. Have you sent in your nominations to the secretary?

The convention in New York, August 28-31, 1951, will be significant for its symposia, papers and field trips. Our host is Shelton College where our Lord had been honored for many years. How delightful it would be if all of us could be there.

We hope to publish another monograph this year. The executive council, meeting at Goshen College, asked Dr. Kulp to prepare a manuscript on the "Age of the Earth" for monograph No. 3. Suggestions for additional subjects are wanted from the members.

What ought the council and the A. S. A. members be doing that now they are not doing? I shall appreciate every communication from any of you which will give us new ideas and initiative for correlating the Scriptures and science and making the results known more widely.

RUSSELL L. MIXTER

NEWS OF MEMBERS

Prof. and Ruth Oorthuys are parents of a baby, born January 4, 1951. They will teach him his ABC's soon and his ASA later on.

R. Laird Harris. My biggest task now happily complete, is the publication of my "Introductory Hebrew Grammar" by Eerdmans. I have had it in various formats for several years and am happy indeed to get it printed up. I may add that I did the work myself on a Vari-typer using photo-offset printing which is a very reasonable method to use for matter including foreign languages or many strange symbols. My Vari-typer is not a recent model, but the work done by the later ones is very good and would be satisfactory for ASA work, I should think, if regular printing would prove expensive.

Wilbur Bullock of the University of New Hampshire is chairman of the Papers Committee for the Shelton College Convention, August 28-31, 1951. He will soon contact you for a suggestion of a paper you could write.

Walter L. Starkey has a change of degree, position and address. A 1950 PH.D in the field of Mechanical Engineering, and assistant professorship at Ohio State University and a home at 2084 Neil Ave., Apt. 12, Columbua 1, Ohio.

William A. Smalley is serving as a missionary with anthropological emphasis at Villa Alliance Dalat, French Indo China. He is co-author of the chapter on Anthropology in Modern Science and Christian Faith.

NEW MEMBERS

Kermit Ratzlaff of Biola, with home address 100 W. Washington, Pasadena 3, Calif. An A.B. from U. of Calif. at L. A. in Zoology and Chemistry.

Donald S. Robertson of 2548 N. El. Molino, Altadena, California is a graduate assistant at the California Institute of Technology. He has a B. A. degree from Stanford with a major in Biology.

Henry M. Morris..Education: Received Ph.D., Dec. 21, 1951, University of Minnesota. Major: Civil Engineering. Minors: Mathematics and Geology. Thesis Title: "A New Concept of Plow in Rough Conduits." Publications: Technical Papers 3, 4, and 5. (each about 25 pp. in length). St. Anthony Falls Hydraulic Laboratory, 1950 (co-author with Dr. Lorenz G. Straub on all three publications).

Charles G. Coleman, Jr. of 5025 Woodland Avenue, Meadowview, D. C., is an employee of the U. S. Naval Photographic Interpretation Center. He has a B. S. degree from Carnegie Institute of Technology with a Major in Civil Engineering and a Minor in Mathematics.

J. Robert Evans of 717 West Grandview Avenue, Sierra Madre, California, is employed as an electronic engineer by the Sierra Engineering Company. He has a B. S. degree from the University of California with a Major in Electrical Engineering.

Herbert A. Meyer whose address is 199 College Avenue, Seward, Nebraska, is an Associate Professor of Chemistry at Concordia Teachers College. He has an M. A. degree from the University of Nebraska with a Major in Chemistry.

Eugene Laverne Hammer is a graduate ssudent at Columbia University. His address is 340 West 55th Street, New York 19, N. Y. He has a B. S. degree from Wheaton College with a Major in Chemistry and a Minor in Zoology and also an M. A. degree from Northwestern with a Major in Education.

Edgar Wesley Matthews, Jr. of 280 Broadway, Sommerville 45, Massachusetts, is a graduate student at Howard University. He has B. E. E. and M. E. E. degrees from Rensselaer Polytechnic Institute.

John Leo Abernathy, Box 555, Williams, California, is currently writing a text book of Organic Chemistry. He has an A. B. degree from U. C. L. A., and M. S. and a Ph.D. from Northwestern all in the field of Chemistry.

NEWS ---- A. S. A.

With one exception, all members approved the new constitution.

Norman L. Loux is enjoying the present year at the Yale University School of Medicine. His address until July 1 is: Yale University, School of Medicine, 333 Cedar Street, New Haven 11, Conn. He expects to return to Butler Hospital in Providence, R. I.

Thomas D. Parks has a new position as the head of the Analytical Chemistry Section of the Stanford Research Institute at Palo Alto, California. His present address is 15788 Via Arrago, San Lorenzo, California.

The school address of John E. Bennett is 710 N. Lake Shore Drive, Chicago 11, Illinois.

THE ATOM SPEAKS AND ECHOES THE WORD OF GOD by D. Lee Chesnut as reviewed in the last issue of the JOURNAL has just come from the press to the A. S. A. library. It is available for lending to members or may be purchased from W. B. Eerdman's Publishing Company, Grand Rapids, Michigan, for $2.50.

BEYOND THE ATOM, by another of our members, John M. DeVries of Calvin College, is an additional confirmation of Christian Faith from a competent scientist. May be purchased from Eerdman's (address above) for $2.50

Saturday evening, April 7, is the time set for the next local A. S. A. meeting sponsored by Wheaton and Goshen College. At this meeting, which will be held at Goshen, Alfred C. Eckert of Columbus, Ohio, will discuss the subject: "Atomic Fission." In connection with this subject, he will review the book by Wilbur M. Smith: "This Atomic Age and the Word of God." Members from surrounding colleges have been invited to this meeting.

LOS ANGELES AREA LOCAL A. S. A. ---------- SCHEDULE OF MEETINGS

1951 PANEL DISCUSSIONS

I MUTATIONS: Can mutations be considered an effective agency in organic evolution? To what extent have mutations been observed in nature, in the laboratory, and what are the limits? Could mutations possibly have spanned the gaps in, for example, the "fossil sequence" of the horse?

Mr. John Sinclair, Chairman
Dr. Walter Lammerts
Prof. David Spaulding

Time: 8:00 P. M., January 16, 1951
Place: Pasadena, Lake Ave. Congregational Church

II BIBLE NUMERICS: Each Greek and Hebrew letter has, in addition to its usual use, a numerical equivalent. There has been a small but vocal group that has maintained that the numerical structure of the Scripture text gives great proof of inspiration. This discussion will consider the validity of this in the light of mathematical probability.

Dr. Robert P. Dilworth, Chairman
Prof. Peter W. Stoner
Dr. Hawley O. Taylor

Time: 8:00 P. M., March 13, 1951
Place: Central Los Angeles area, location to be announced

III MOSES' HEALTH LAWS: This discussion will treat the remarkable health rules laid down for the Hebrews in with wilderness. Special attention will be given to a comparison of Moses' rules with the contemporary medical knowledge of Egypt and other nearby countries.

Dr. Marvin Darsie, Chairman
Dr. Earle E. Newhart
Dr. Roland Icke

Time: 8:00 P. M., May 8, 1951
Place: Moody Institute of Science, West Los Angeles

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METHODS OF DATING THE EARTH AND THE UNIVERSE

Delbert Eggenberger
Research Chemist, Armour and Company

The problem of the age of the earth has been a difficult one to solve. There has been an almost constant friction between the estimates of the scientific world and those of the theological world. Most of these differences were needless inasmuch as some estimates in both camps were quite tenuous. Before proceeding further with the resolution of these differences we shall examine the methods of science in setting the age of the earth and of the universe.

Suspicion that the earth was immensely aged was raised by Halley in the early eighteenth century from a study of salt deposited in the sea. Later in the same century, Hutton, basing his conclusion upon the study of geologic formations, stated that he could find "no vestige of a beginning." During the nineteenth century, estimates of the earth's age were rampant, with virtually no upper limit. Kelvin, however, basing his results on studies of temperature gradients in the earth, assuming it to have started from a molten ejection from the sun, concluded that the earth must not have been present for more than 400 million years. He later reduced this figure considerably. However, the discovery of radioactivity with its continuous generation of heat in the earth's crust vitiated Kelvin's work.

More recent work in several directions has indicated an age of several billion years. It appears that the ages of the earth and of the universe are of the same order -- at present, no difference can be detected by direct measurement. In this paper, methods will be considered under three general headings, namely, terrestrial, solar (referring to extraterrestrial bodies within the system), and cosmic.

Terrestrial

Radioactivity measurements comprise the most important method of dating the earth. Details of the method and its limitations may be found in the American Scientific Affiliation publication entitled "The Age of the Earth" (1948).

The ages of the oldest undisturbed rocks are given as about 1.8×10^9 years for Siberian uraninite and 2.0×10^9 years for uraninite from Manitoba. The latter is particularly interesting in that the rock affords three checks, one with uraninite containing uranium, another with monazite containing thorium, and a third with mica containing rubidium. The ages range from 2.0 to 1.6 billion years. (1), (2). Undisturbed rock ages provide the lower limit to the earth's age.

It was suggested by H. N. Russell that the age of the earth's crust could be determined by taking representative values for the quantities of uranium and the corresponding lead isotope. The assumption is, of course, that lead isotope 206 all came from uranium parentage. This investigation has been carried out by several workers. Holmes (3), in studying collected results, found a concentration of values around 3.35×10^9 years. This figure, or one only slightly lower, has been verified by others. (4), (5). Therefore, it appears that the age of the earth's crust can be placed somewhere around 3½ billion years.

One further support of the age of several billion years has been suggested by Gamow, (6). Nuclear transformation theory requires that the original abundance of U^{235} be about the same as that of U^{238}. With a knowledge of the half-lives of each of these isotopes and the present abundance ratio of 1 to 139, it is possible to calculate the approximate time of their equal abundances. This figure is of the order of several billion years.

Solar System

The present state of the moon's motion is that of a spiral of increasing radius. Calculations by Sir George Darwin indicated that the time required for the present state to develop, assuming the moon had its origin near the earth, would be several billion years. Darwin evolved a tidal theory of the formation of the moon, which theory has been quite generally discarded since the work of Jeffries. The latter showed that frictional energy within the combined body would be so great as to preclude such destructive resonance as Darwin postulated. However, the possibility that the lunar satellite originated at or near the earth is at present considered reasonable.

The ratio of helium to uranium or thorium in meteorites, studied by Peneth and others (8) gives ages ranging from six million to seven billion years. However, since the smaller ones have the higher helium content it appears they have been affected by alpha particle bombardment. The upper limit is concluded to be about three billion years for the age of meteorites.

Cosmic

Star clusters are plentious throughout our galaxy. Chandrasekhar (9) has shown that the probability of a star's escape from the gravitational field of the cluster in time t -- such escape velocity having been attained statistically by an "evaporation" process resulting from the buffeting action of the other stars in the cluster -- is $1 - e^{-t/t_o}$ where t_o depends on parameters of the cluster. This buffeting results from gravitational forces acting through a distance. If $t = t_o$, this probability is 0.63, which may be considered the order of lifetime for the cluster. t_o for Pleiades is 3×10^9 years. Since clusters such as Pleiades are quite common yet in our galaxy, that figure is taken as a reasonable average age for the clusters.

The study of binary stars affords another statistical method of estimating the age of the universe. The influence of an outside star near a binary pair is felt more by the nearer of the pair. The result of these approaches is an increased radius of rotation and ellipticity of the orbit. A sufficient accumulation of such approaches results in a dissolved partnership between the binary stars. Chrandrasekhar (10) has calculated this disruption time for our galaxy as $t = 2.2 \times 10^{15}\ a^{-3/2}$, where a is the semi-major axis in astronomical units (1.5×10^8 km.). Studies of the distribution of separation between stars of binaries result in the conclusion that a time of the order of several billion years is correct. Bok (11) has studied both binaries and clusters and concluded that an age of 3 to 4 billion years is quite probable.

Paradoxically, while the time-scale calculated by use of the expanding universe model would be the simplest and most direct, the value found has been somewhat difficult to reconcile with the others. The figure of 1.84 billion years obtained by using a simple classical model is considerably lower than the some three billions demanded by most other methods. Russell suggests that expansion may have been slower at first because of the smallness of space then. Tolman (2) applied relativistic corrections to the simple model and found that it produced an even smaller time, 1.24 billion years. He has claimed some success in expanding the time-scale by assuming the non-homogeneity of matter in space.

The evidence of the age of stars while lending some rough support to the general picture is rather inconclusive.

Another general evidence is afforded in the temperature drop of the universe with time. Jeans demonstrated that the temperature would drop inversely as the

square root of time. Assuming a beginning temperature of 15 x 10^9 ^oA -- necessary for nuclear transformation to occur -- and a present temperature of 50 ^oA, the time elapsed comes out about three billion years.

Conclusion

It appears, then, from our examination of several independent lines of evidence that the beginning of our present universe was some three billion years ago. Bishop Ussher, in the seventeenth century, concluded that the Biblical creation was 4004 B. C. The inclusion of that date in a large portion of Bibles published since that time have led many to feel that Biblical and scientific cosmogonies were irreconcilable. The result has been an unfortunate breach between two groups, both of which are in error. The one group holds that the very old date indicated by the methods of science is in conflict with the Scriptures and therefore the latter is not the inspired work of God. The other group, accepting the Bible as the revelation of God, holds to a comparatively recent creation in spite of much clear evidence to the contrary.

It has been shown by Hebraists that the words translated in Authorized and other versions as "day" could as well be translated some long period of time and "morning and evening" as "beginning and ending." Also "begat" does not necessarily imply a direct son but may mean a descendant.

The conclusion to be drawn is that the Scriptures themselves do not teach a short time-scale but its teachings are quite consistent, and without strained translations, with a very old date of creation and with long geological processes.

References

(1) H. N. Russell, Science 92, 19 (1940)

(2) R. C. Tolman, Rev. Mod. Phys. 21, 374 (1949)

(3) A. Holmes, Nature, Lond. 157, 680 (1946)
-- , ibid, 159, 127 (1947)
__ , Endeavour 6, 99 (1947)

(4) C. Feste and M. Santangelo, Ann. Geofis. 2, 503 (1949)

(5) C. Morelli, Ann. Geofis. 2, 417 (1949)

(6) G. Gamow, Lecture before Physics Club of Chicago, 1949.

(8) W. J. Arrol, R. B. Jacobi, and F. A. Paneth, Nature, Lond. 149, 235 (1942)

(9) S. Chandrasekhar, Astrophys. J. 97, 255 (1943)
-- , ibid, 98, 54 (1943)

(10) S. Chandrasekhar, Science 99, 133 (1944)

(11) B. J. Bok, Mon. Not. Royal Astro. Soc. 106, 61 (1946)

(12) P. Rossier, Arch. des Sciences 22, 89 (1940)

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RECENT SOUTH AFRICAN FOSSIL FINDS

Marie Fetzer
Instructor in Anthropology, Wheaton College

During the past three years there have been a number of newspaper reports and popular magazine write-ups of the "new missing link" from South Africa. Two such articles may be found in Life, March 21, 1949, and in the November, 1949, issue of Scientific American (Broom, 1949).

The first discovery in this group of fossils goes back to 1925. A quarry man, blasting in a fossiliferous lime deposit near Taungs in West Transvaal, South Africa, came across a small skull which looked very human to him. The skull was sent to Dr. Raymond Dart, an anatomist from the University of Witwatersrand in Johannesburg. Dart studied the skull, reached the conclusion that it was that of an infant being intermediate between a higher ape and man, and early in 1925 published a paper describing this fossil, which he names Australopithecus africanus. Eleven years later, in 1936, Dr. Robert Broom, who was working at the Transvaal Museum in Pretoria, resolved to look for an adult skull of this species. His search took him to some fossiliferous caves at Sterkfontein in Central Transvaal, 40 miles from Johannesburg, where he found several fossil fragments that fitted together to form part of an adult skull. This he names Plesianthropus transvaalensis. During the next few years many other skull frements, isolated teeth and parts of limb bones were found at this place and attributed to the Sterkfontein man. In 1938 Dr. Broom heard of a schoolboy from Kromdraai, two miles east of Sterkfontein, who had found some fossil bones and teeth at a weathered outcrop of fossil-bearing limestone. He located the youth and obtained some fragments of a palate bone, much of the left side of the face, and the right side of the lower jaw with most of the teeth. On the basis of these bones, a new type was christened, Paranthropus robustus. Collectively, these three have been known as the Australopithecinae. Fossil-hunting activity almost ceased in South Africa after this, but at the close of the war it was resumed. Excavations during the past three years have added much material to this which has just been described.

Most of the recent work has been done at Sterkfontein, where many more bones attributed to Plesianthropus transvaalensis have been found. In the early part of 1947 Dr. Broom described the "crushed snout of apparently a young male with some beautiful teeth..." and "a fragment of the snout of a young child of about three years." Closely following this he described a nearly perfect adult skull of Plesianthropus transvaalensis without the mandible and with the brain case broken across. About the middle of the year Dr. Broom described the nearly complete and fairly well-preserved lower jaw of a large middle-aged male, and with it much of a humerus and scapula. In the fall he discovered a perfect pelvis, much of a femur, a tibia, some ribs and vertebrae, and parts of the skull very badly crushed and broken. In 1948, another nearly complete, though broken, male mandible was found at Sterkfontein.

Finds attributed to the same genus as Australopithecus africanus, but given the new species name of prometheus, hence, Australopithecus prometheus, were found in the Makapansgat valley in Central Transvaal, about 180 miles north of Sterkfontein, due to the searching of Professor Dart. The recovered bones of Australopithecus prometheus include a female occiput comprised of the major portion of the occipital bone, with most of the right margin of the foramen magnum, and the posterior third of each parietal, an adolescent male mandible with virtually perfect body and dentition, an almost complete left ilium, and the major portion of a right ischium of an adolescent, an isolated and warped right parietal bone of an infant, and a craniofacial fragment of an adult.

Dr. Broom, in 1949, made further excavations in a cave on the farm Swartkrans one mile north of Sterkfontein, and found there what he terms remains of 8-10 individuals, including a practically complete but considerably crushed child skull of perhaps 7 years, two fairly complete but very badly crushed adult skulls, five lower jaws, four snouts, and a considerable number of isolated teeth. These individuals he calls Paranthropus crassidens.

A general summary of the South African material is given by Dr. Broom (Broom, 1950). It can be tabulated here as follows:

Australopithecus africanus

Taungs	1925	Dart	front half of skull top well preserved brain cast almost complete facial skeleton milk and permanent teeth

Plesianthropus transvaalensis

Sterkfontein	1936	Broom	2/3 of a brain cast base of skull 2 Maxillae fragments of a brain case, which when restored, yielded most of skull
"	1936-38	"	other skull fragments isolated teeth parts of limb bones
"	1947	"	2 snouts isolated adolescent teeth adult skull nearly complete mandible humerus scapula pelvis tibia ribs vertebrae femur mandible, with most of teeth

Paranthropus robustus

Kromdraae	1938	Broom	fragments of palate bone much of left side of face left side of skull base fragments of arm, hand, and foot bones distal end of humerus

Australopithecus prometheus

Makapansgat	1947	Dart	female occiput adolescent male mandible left ilium, right ischium right parietal of an infant adult cranio-facial fragment

Paranthropus crassidens

Swartkrans	1947	Broom	skull of child 5 mandibles 4 snouts many isolated teeth

Detailed descriptions of the metric measurements and observations of anatomical landmarks characterizing each recovered bone are found in the literature cited in the bibliography of this paper. As this material is of a very technical nature, a series of quotations which will present general interpretations of these measurements and observations will be given.

Dr. Dart says concerning the Taungs material that because of the shape and pattern of the teeth, the size and proportions of the brain, and shape of the forehead region, Australopithecus africanus is midway between ape and man. Dr. Broom says of the Sterkfontein material that the brain is like that of a modern ape, while the face bones are human in type and some of the limb bones suggest an upright posture. The Sterkfontein humerus, according to Broom, is human in its size and structure. The scapula is not quite human, but also not anthropoid. The femur agrees in most characters with the femur of a small human being, and indicates that the creature walked erect. The Australopithecus prometheus occiput has many human characteristics, and the pelvic bones are similar to those of modern Bushmen. Dr. Dart (Dart, 1949) says "...(they are) more closely related to man than ....to apes. They are proto-human beings; and they are the most primitive hominids of whom we have knowledge." He quotes Dr. LeGros Clark, an English anatomist: "They were hominids of small stature (probably similar in this respect to the pygmy races of present-day mankind), with brains not much larger relatively than those of the gorilla and chimpanzee, massive jaws showing many human features, a dentition fundamentally of human type....and limbs approximating in their structure and proportions to those of the Hominidae. They were evidently capable of standing and walking with an almost erect posture, and the hands and feet were relatively small and delicately built."

Dr. W. M. Krogman, physical anthropologist from the University of Pennsylvania, has written his interpretation of the South African fossil material (Krogman, 1948). "What does our evidence on the Australopithecines add up to? It is this: that in the Pliocene period, about seven million years ago, there lived a form that was intermediate between anthropoid and man. He had a brain near the anthropoid, a dentition practically human, and a general skeletal build well-adapted to the human upright position and locomotion. The Australopithecines fulfill almost every requirement of a real connecting form. Moreover, they show that the rate of evolution differs in various parts of the body: thus dentition is ahead of long bones, and long bones are ahead of brain.

"We are certainly not sure of the precise evolutionary position of the Man-Apes. The problem is: were they a link in the direct line to man, or were they abortive offshoots of an attempt by an ape to make the grade to man's estate? The first alternative seems to me the more likely."

Dr. Broom (Broom, 1949) says: "As the case stands at present, we have conclusive evidence that a family of higher primates which were practically human, but with relatively small brains, lived in South Africa for probably hundreds of thousands of years...But I personally do not think that the ape-men are anthropoids. I believe that the human line split off from the anthropoids at least as early as the Lower Oligocene, perhaps 25 million years ago, and that the nearest known type to man's remote ancestor is not a chimpanzeelike ape but the little fossil ape Propliopithecus of Egypt. I suggest that the ape-men of South Africa came on a

different line from the higher apes, and that one of them became the ancestor of Homo sapiens."

What then? Is this conclusive evidence concerning the origin of Homo sapiens? Let us turn to other articles, to see what at least one other person has observed from this same material. Dr. William L. Straus, Jr. of Johns Hopkins University, has written several articles which have appeared in the American Journal of Physical Anthropology. In describing the humerus of Paranthropus robustus, Straus writes: (Kern and Straus, 1948): "Both of these writers (Broom and Dart) have stated that this humeral fragment is basically human in morphology rather than anthropoid-ape, and Broom has used it as a main prop in his argument that the Australopithecine forelimb was essentially similar to that of man and was not supported by the requisite comparisons, metric and otherwise, with other primates. Nor have adequate illustrations of the bone been published (strangely, no photographs have been made available). For this reason, particularly in view of the far-reaching and important claims that have been made respecting the significance of this fragment, its careful re-study has been indicated."

Straus re-studied the humeral fragment, and concludes: "In general, however, Paranthropus bears a greater resemblance to the average chimpanzee than to the average man; for in 14 of the 19 indices its value is closer to the mean of the anthropoid ape....In no circumstance can the fossil fragment be regarded as intermediate or 'transitional' between the humeri of the anthropoids and that of man.

"The lower end of the humerus is basically so similar in man and the anthropoid apes that this region is of extremely limited value in taxonomic and phylogenetic studies. It thus gives no real clue to general humeral structure, much less to the structure and usage of the forelimb as a whole. There is no justification for the claims of Broom that the arms of the Australopithecines were not used for walking or climbing.

"We still lack the evidence necessary to conclude whether the forelimb of the Australopithecines was that of a biped, or a quadruped, or a brachiator."

The same author writes the following concerning the femur of Plesianthropus transvaalensis (Straus, 1949):

"Both Broom and Le Gros Clark have stressed the essentially manlike nature of this femoral fragment, which is quite small for that of a man yet within the size range of the Bushman femur (Le Gros Clark, '47b). Largely because of its presumed peculiarly hominid characters, both of these investigators have concluded that this bone belonged to an animal that was capable of standing and walking in the erect posture....

"That the fragmentary femur of Plesianthropus in general strongly resembles the corresponding part of that bone in man and differs markedly from those of the anthropoid apes, is not to be contested. The descriptions and illustrations of Broom and Le Gros Clark amply affirm this conclusion. But it remains to be proven that the characters that it displays are peculiarly and exclusively hominid, and that such characters are necessarily indicative of ability to assume and maintain an erect, bipedal posture. While engaged in a comparative study of the femur, we have noted that in a number of points the Plesianthropus fragment is remarkably similar to the femora of Old World monkeys, an observation which has caused us to question the validity of the conclusions of Broom and Le Gros Clark. Neither of these workers seems to have included the monkeys within the scope of his investigations but rather to have limited his comparative studies to man and the anthropoids, particularly the great apes. A careful reconsideration of the nature of the Sterkfontein femur is therefore indicated. Unfortunately, no cast of this

specimen is available to us for study. In Le Gros Clark's second paper ('47b), however, there are sufficient data on several important points to enable us to make comparisons with our own observations on series of extant catarrhines--including man, anthropoid apes and monkeys--and thereby to assess the taxonomic and functional significance of the major features of the fossil bone. Le Gros Clark deals especially with 5 femoral characters, which will be discussed below.

"Both Broom and Le Gros Clark have claimed that the characters of the Plesianthropus femur are peculiarly hominid and definitely indicate that the animal was capable of assuming the erect, bipedal posture. In view of its equally close resemblance to the femur of man and those of cercopithecid monkeys, however, it cannot be said to be more hominid than cercopithecid, nor to be more indicative of an erect, bipedal posture than of a pronograde, quadrupedal posture."

The age of this material is unknown from a quantitative point of view. There has been no adequate study of the sites by geologists, which has appeared in print, so far as this author has been able to determine. Dr. Broom (Broom, 1949) makes the following statements concerning his use of a field geologist:

"...our Historical monuments Commission, which believes it has dictatorial rights to decide who is to be allowed to hunt for fossils, and how the work is to be done, intervened and warned me I would not be allowed to excavate except under conditions which I regarded as insulting. I was to be allowed to work only in collaboration with a 'competent field geologist,' who was to be consulted whenever a blast was contemplated. To continue on such terms was impossible..."

He stopped work at Sterkfontein for a short while, but later resumed it, working without the necessary permit from the Historical Monuments Commission. A valuable discovery was made, and concerning this Broom writes (Broom, loc.cit.) "Of course the discovery was much too important to please the Historical Monuments Commission, especially as it had been made by defying them and by breaking the law. They sent a deputation to General Smuts protesting that in my excavations I paid no attention to stratigraphy and was destroying valuable historical evidence required for dating the specimens. Though there was no truth in the allegation, I was temporarily stopped. However, B. V. Lomdaard, professor of geology at Pretoria University, was invited to look into the matter and reported that there was no stratigraphy whatever where I had been working, and that I was doing no harm. So they had to allow me to continue, though still under absurd conditions to which I pay no attention."

It should be noted that field work in human paleontology is not generally carried out in this fashion. Most of the human fossil material has been carefully documented both morphologically and chronologically. The sites of the Sinanthropus fossils, the Pithecanthropus fossils, the Heidelberg fossil, and the Swanscombe fossil, to mention a few, have been studied carefully by trained field geologists. and the findings are available in the literature.

From this survey of the literature we find that the excavations in South Africa have not been carried out in the strictest scientific procedure. We also find that there is disagreement by at least one other competent anatomist concerning the diagnostic features used by Broom and Dart, thus making definite decisions concerning the relation of these fossils to other higher primate fossils impossible at present. Further study must be made of these fossils from both a morphological and a chronological aspect, in order that their correct relation to other fossils may be ascertained.

Bibliography

Broom, R. (1949) "The Ape-Men," Scientific American, November , p. 20.
Broom, R. (1950) "The Genera and Species of the South African Fossil Ape-Men," American Journal of Physical Anthropology, vol. 8, #1, March, p.1
Broom, R. and Robinson, J. T. (1947a) "Jaw of the Male Sterkfontein Ape-Man," Nature, vol. 169, p. 153
Broom, R. and Robinson, J. T. (1947b) "Further Remains of the Sterkfontein Ape-Man, Plesianthropus," Nature, vol. 160, p. 430.
Broom, R. and Robinsin, J. T. (1949) "A New Mandible of the Ape-Man, Plesianthropus transvaalensis," American Journal of Physical Anthropology, vol. 7 #1, March, p. 123.
Dart, Raymond A. (1948a) "The Makapansgat Proto-human Australopithecus promethesus," American Journal of Physical Anthropology, vol. 6, #3, September, p. 259.
Dart, Raymond A. 1948b) "The Adolescent Mandible of Australopithecus prometheus," American Journal of Physical Anthropology, vol. 6, #4, December, p. 391.
Dart, Raymond A. (1949a) "The Predatory Implemental Technique of Australopithecus," American Journal of Physical Anthropology, vol. 7, #1, March, p.1.
Dart, Raymond A. (1949b) "The Cranio-facial Fragment of Australopithecus prometheus," American Journal of Physical Anthropology, vol. 7, #2, June, p. 187.
Dart, Raymond A. (1949c) "The First Pelvic Bones of Australopithecus prometheus," American Journal of Physical Anthropology, vol. 7, #2, June, p. 255.
Kern, Howard, M., Jr. and Straus, William L., Jr. (1949) "The Femur of Plesianthropus transvaalensis," American Journal of Physical Anthropology, vol. 7, #1, March, p. 53.
Krogman, W. M. (1949) "Man-Apes of South Africa: Recent Fossil Finds Named Plesianthropus," Scientific American, vol. 178, May, p. 16.
Straus, William L. Jr. (1948) "The Humerus of Paranthropus robustus," American Journal of Physical Anthropology, vol. 6, #3, September, p. 285.

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Comments on RECENT SOUTH AFRICAN FOSSIL FINDS

Dr. Cowperthwaite

I would like to ask a question regarding the possibility of plastic deformation of bones throughout long periods of time. I noticed that in the data you gave, the teeth which were small structures, were quite human in type, but that the long and thin bones showed variations. I was wondering if it was possible for plastic deformation to operate so that it would be difficult to determine the actual original shape of these bones.

Miss Fetzer

I am afraid I couldn't give you very much information on that because I don't know much about plastic deformation. I don't think so. Perhaps Dr. Maxwell might answer that more fully.

Dr. Maxwell

I can't answer.

Mr. Uuras Saarnivaara

As I remember, the profile of the ape is sometimes so similar to man that many times it is almost impossible to distinguish them from one another so that the fact that some of the teeth of these South African Apes are somewhat human does not necessarily mean anything because apes sometimes have teeth which look very much like human teeth.

Dr. Bullock

Straus has produced a review article which was published in September, 1949, in the Quarterly Review of Biology. It summarizes the situation that we have. The title of his article is "The Riddle of Man's Ancestry." It ends up with the conclusion that man's ancestry must remain for some time yet a riddle. In his paper he attempts to prove that man has not developed from the anthropoid line. You might be familiar with the branch family trees that are usually put up - man coming from an ape, then man coming from a man ape and that junction is retreating. Man has not even developed from a monkey, but man has developed from a prosimian. His arguments are not so much based on his recognition that man has come from an earlier monkey but that he has not come from the anthropoid ape.

Dr. Kulp

There certainly has been a lot of sloppy thinking in anthropology. Part of it has been due to the fact that in the modern scientific world a person in one field does not know anything in another field. Broom evidently has no knowledge or appreciation whatsoever for what geological data holds on these findings.

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THE GUILT REACTION

John R. Howitt, M. D.
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One of the most significant factors in human experience is the sense of guilt. Feelings of guilt are experienced very early in life, at least as far back in childhood as one can remember. The small boy, for example, who has never been told that he must not steal the cookies, nevertheless feels an immediate sense of guilt when he does so. This is at once apparent when the mother discovers the child in the act of stealing. When a child first masturbates, he usually does so without breaking any command of his parents; nevertheless he is very conscious of a sense of guilt. Feelings of guilt must, therefore, be present very early in life, perhaps even in infancy.

A Universal Human Experience

The guilt reaction is also universal in human experience. Longfellow (1) has said "that in even savage bosoms there are longings, yearnings, strivings for the good they comprehend not." These elementary aspirations reflect the sense of guilt in primitive man, a sense of failure and a realization of imperfection which cannot be understood or satisfied. Missionaries report that the primitive native is invariably conscious of a sense of sin.

No Sense of Guilt Among Other Animals

There is certainly no evidence of any such element in the whole realm of biology apart from man. There is no indication whatever that animals experience

any feelings of guilt in stealing food, or in mating when and where they please, or in destroying each other. It is true, of course, that animals can be trained to protect property and not to do certain things which their master forbids, but this is the result of training and may be regarded as a conditioned reflex.

The Sense of Guilt

The sense of guilt might be compared to a natural instinct, like that of hunger or self-preservation, and it is the inevitable outcome of man's å priori moral sense of good and evil. This moral sense stems from the sin of our first parents who ate of the tree of the knowledge of good and evil. (Gen. 2:17 and 3:6) Because man can distinguish between good and evil, as no other species is able to do, he alone is morally responsible for his conduct and he alone experiences a sense of guilt when he commits sin. Adam and Eve were immediately conscious of their guilt (Gen. 3:7) after they had eaten of the forbidden fruit.

Gregory Zilboorg (2) seems to recognize the instinctual nature of the sense of guilt although, as an analyst, he naturally interprets the same from the psychoanalytical point of view. He states that "Freud showed the humble origin of man's mind, but he also showed that man possesses almost an instinct against many of his lowly, universal drives." No one can escape from this inner consciousness of guilt and there is ever present in the heart of man a haunting sense of failure and of judgment to come. The guilt reaction is indeed intimately linked with the thought of judgment and the two concepts are inseparable. "It is appointed unto men once to die, but after this the judgment. (Heb. 9:27)

The Conscience

The word "conscience" comes from the Latin verb 'cognosco' to know, and implies nothing more. The word does not appear in the King James version of the Old Testament. In the New Testament, the Greek word so translated (according to Strong's concordance) implies the thought of co-perception, meaning to see completely or to understand or to become aware. The word occurs 32 times in the New Testament and in each instance the meaning appears to be the same, that of consciousness or awareness. Conscience might, therefore, be described as the sum total of all our awareness or knowledge in the moral sphere. The conscience might be regarded as the outgrowth or development of the å priori or instinctual knowledge of good and evil.

With the development of the intellectual faculties there occurs a corresponding development of the moral sense. The intellectual faculties have fully developed by the age of 14 to 16 which is the normal standard of intelligence and the moral sense, or the ability to distinguish between good and evil, appears to have fully developed by this time also. It was for this reason that long ago the Church with a profound knowledge of practical psychology set the age of confirmation at 14. It was believed that at this age the child's moral sense was sufficiently developed to make him responsible for his own conduct and to enable him to make his own decisions. This truth was discovered by the Church long before the modern science of psychology came into being and long before the development of intelligence tests.

As our knowledge of good and evil develops from infancy to maturity the conscience must have some relation to a fixed standard or moral code and that standard we know is revealed to us in the Ten Commandments. These commandments were not given until nearly 2,500 years after the expulsion from Eden, but during the intervening period of time between Eden and Mount Sinai man enjoyed a knowledge of good and evil as the record clearly shows, due to his instinctual knowledge and the revelations of God. Later, however, the standard of good and evil was defined in the Ten Commandments.

The Doctrine of Rewards

The atheists state that Christianity is unethical because of the doctrine of rewards. Theoretically there should perhaps be no incentive necessary to do what is right. It may be said that virtue is its own reward, but God, in His infinite wisdom, knew that "the heart is deceitful above all things and desperately wicked." (Jer. 17:9) In his fallen state man must have some incentive to counteract the evil within. The doctrine of rewards implies a sense of responsibility and therein lies the ethical value of the incentive. The same concept carries with it also the negative aspect of condemnation where there has been failure. Here then is the basis of the guilt reaction. We can distinguish between good and evil and when we fail to do what is right we stand condemned as a consequence of which feelings of guilt are engendered. "Therefore thou art inexcusable, O man." (Rom. 2:1)

Origin of the Guilt Reaction

According to Freud the guilt reaction, or the guilt complex, has emerged in the process of evolution by the development in man of the super ego, which is not in the realm of consciousness. But if the guilt reaction developed by a process of evolution, from what did it develop? We have already noted that there is no evidence of any sense of guilt in the lower animals and the reason for this is that they have not the knowledge of good and evil which we enjoy. No special revelation has been given to them, as to man, nor are they capable of understanding the Ten Commandments. Therefore, they will not be judged in eternity as we shall be. It would probably be futile to argue that the knowledge of good and evil with the consequent sense of guilt in man leaves an unbridgable gap between himself and the lower primates. Nevertheless to the Christian this is obvious and needs no further elaboration or confirmation.

The guilt reaction could not have evolved from the brute creation. Why should a man feel guilty when he steals bread in order to satisfy his natural hunger for food or to preserve his life? Why should a man experience any feeling of guilt in indulging his natural desire towards a woman who is not his wife? There can be only one answer. It is because man alone of all the species can distinguish between good and evil.

Consequence of Guilt

The sense of guilt is one of the most potent sources of fear and misery among men. It has been said that no man can be happy who has a feeling of guilt and this is probably true. In a Christian society even such relatively trivial matters as a slight act of discourtesy or rudeness will leave one with a sense of guilt and shame which may render a person unhappy and miserable for a time.

There is no question of the part which the guilt reaction plays in the role of mental hygiene. Thus Prof. Paul E. Johnson (3) of Boston University states quite rightly that "Guilt is a problem that concerns religion first because religious people are responsible for fostering a sense of sin - talking and teaching of God as a stern judge, a watchful eye who is continually looking on and seeing even what we do in secret and what our secret thoughts may be, and teaching that God is an avenging and punishing Deity. High moral ideals, which are fostered by religion, increase tension and failure. Perfectionism is a painful stress that consistently brings on a sense of inferiority....

Religion has also taught a vivid eschatology of reward and punishment in the future life to stimulate the urgency of attaining these ideals and the fear of failing short of them. Religious codes also have repressed sex and the lusts of the flesh with forbidding commandments - 'Thou shalt not'. They have added

increasing emotional anxiety by cosmic imperatives which bring more urgency behind this sense of guilt.

Religious organizations and people, therefore, have a special responsibility because of fostering the sense of sin. We also have responsibility to provide a way of solving guilt problems. The burden becomes unbearable unless release is offered. Severe depressions and compulsions, withdrawal or paranoiac tendencies may arise in this way."

Evasion of the Sense of Guilt

There can be no doubt that a sense of guilt and failure may lead to a morbid state of mind. In recent years, however, a very simple solution to this problem from the point of view of mental hygiene has been evolved. Since the moral law is the basis of man's sense of guilt with its consequent fear and anxiety it has become more and more common to ignore entirely the law of God. This is well illustrated in the sexual field. The publication of the Kinsey report, for instance, has revealed that perversions of one kind or another are perhaps more common than was formerly suspected. Now all this information is to be made the basis of a new moral code. What people do by nature is now regarded as normal and will constitute the moral code of the future based on biology apart from any ethical or Divine standard whatever. Prof. Kinsey (4) and his associates thus "conclude that normality and abnormality are primarily moral issues without biologic justification and that it is society's code which is responsible for the psychic trauma causing personality disturbance."

It may be noted in passing that if we concede one aberration from the moral code as right or proper we would have to condone all aberrations. Thus if we approve of homosexuality on the ground that it is, like left handedness, a personality trait beyond the scope of the individual to change, then we would have to approve of sadism also as a component of the personality. And if we approve of these perversions as normal or right we must accept the consequent working out of the same in the lives of the individuals, with all that that implies. It is amazing how far and how rapidly one can travel if one fails to recognize the true state of fallen man.

Moral Declension

It is interesting to follow the three stages which have led the world into its present chaotic state of lawlessness and fear and hatred. First of all the great humanitarians or humanists taught that religion could be abolished without destroying morality. It was contended that morality would be preserved for its own sake. It was even taught that there was no relationship between religion and morality. In practice, however, this concept has led to hopeless failure as we all know. The next stage in the downfall was to suggest that morality could be discarded without impairing the order of society. All too late it is being discovered that without morality the enforcement of law is impossible and chaos inevitably follows. If the moral law be defied in the sexual field, for example, it is inevitable that there will be a rapid increase in lying and stealing as well. And when the rights of property are not respected, neither will the lives of men be respected. This inevitably leads to an increase in murder and brutality as we see everywhere today. The third stage in the downfall is the idealization of the very lawlessness which is the outcome of the breakdown of morality. Lawlessness and sin and violence are being extoled as virtues in themselves and the end result is that "men's hearts are failing them for fear, and for looking after those things which are coming on the earth." (Luke 21:26)

Morality and Psychology

Psychiatrists and psychologists have largely followed the destructive teachings of Freud and the general idea has developed that the moral law with its implication of the guilt reaction should be abolished on the ground of mental hygiene. This would relax the inhibitions and eliminate all the discordant complexes which beset the human mind. By abolishing the sense of guilt we would be emancipated from its sordid influence and all men would be free. Such is the forlorn hope of the modern world.

Zilboorg (2) fully appreciates the quarrel between religion in the broad sense of the term and psychiatry over the guilt reaction and states that "psychiatry must get away from its new medievalism which, by identifying the neurotic and the moral sense of guilt, serves to ascribe moral values to health and disease." He has stated elsewhere (5) "For of recent years we seem to have fallen into the general error that all sense of guilt is neurotic, all conscience reactions are super-ego reactions, and that not to feel guilty is the ideal of normalcy. It is this almost unconscious, purely philosophical error into which we have drifted that has made up a prey in the hands of those who would attack psychiatry and psychoanalysis for their alleged godlessness and immorality."

The Concept of Punishment

The fact of guilt involves the question of punishment. In the Christian ethic there is no ambiguity or doubt of the reality of punishment for sin. "The wages of sin is death." (Rom. 6:23) Our Lord's description of the rich man in hell (Luke 16:23-24) and other passages of Scripture (Mark 9:43) are sufficient authority for the truth of punishment beyond the grave for the sins done in the flesh. It is interesting to note, however, the rapid decline in recent years of the concept of punishment as ethical and proper. Largely as a result of the philosophy and teaching of John Dewey, many authorities now consider it wrong to punish children. The muddled thinking of the modern world seems to confuse cruelty with punishment, but this is only an example of the superficial thinking of today. Punishment implies the concept of paying the penalty and must be just and tempered with mercy, but cruelty is the infliction of pain or suffering without cause. It is often a greater cruelty not to punish a child than to allow him to grow up with bad habits which will destroy his usefulness in society and his enjoyment of life in later years. Childhood is the Divinely appointed period of life for training. It is of primary importance, therefore, that children should be trained rather than amused. How are children to understand the great principles of the judgment to come if they do not learn in childhood that punishment follows wrong doing?

Not only in regard to children, but in the case of lawbreakers, the same curious confusion of thought occurs. Hugh Christie (6), Director of Corrections in the Province of Saskatchewan, states that "In spite of almost universal acceptance of the fact that prisons, when using retributive methods, make little contribution to the genuine protection of society, Canadian institutions remain almost completely punitive in nature." The article then goes on to describe some of the cruelties which exist in Canadian penal institutions today. Cruelty, of course, can never be justified, but punishment is necessary as a deterrent to the offender and it is corrective as many of us can testify from childhood experience. This truth is also confirmed by the testimony of many offenders against the law who have learned their lesson. It is well that men should learn here and now that wrong doing will be punished else how will they ever understand the truth of the judgment to come?

In discussing the problem of juvenile delinquency and the increase in crime, the trouble is that those in authority do not realize that we have entered upon

the period of time which the prophetic Word has foretold would be characterized by the spirit of lawlessness, and which will prepare the way for the antichrist who is the lawless one. (2 Thess. 2:7) Consequently all investigations which do not take this fact into consideration are quite useless and futile. So much is hidden from those who cannot discern the signs of the times. (Matt. 16:3) The truth of our Lord's second advent is the only key by means of which we may understand the days in which we live.

The Only Solution of the Problem

There is only one solution to the problem of guilt. Prof. Read Bain (7) of Miami University refers to the doctrine of the blood atonement as one of the man-made myths. Nevertheless this so called myth is the basis of our present peace of mind and of all our hope for eternity. "Without the shedding of blood there is no remission of sin." (Heb. 9:22) It is this very fact which gives us the Scriptural and true answer to the problem of the guilt reaction. Instead of abolishing the moral law, as has been suggested, with all its consequent ruination to the peace of the world, let us rather abolish the sense of guilt in the individual with its attendant morbid results by finding a substitute to bear the penalty of sin and purge away the guilt. This is the Divine prescription.

The doctrine of the atonement is the only logical solution to the problem. If we accept the free gift of salvation by faith through the merit of Christ's atoning work on Calvary, then there will be not only judicial forgiveness but release of tension and peace of mind which are not possible under any other circumstances. There will be no fear of the judgment to come for the believer's sins have been judged already on Calvary. The Gospel, therefore, presents the only satisfactory answer to this problem and it is applicable to all who will accept the gracious invitation of the Saviour of the world Whom to know is life eternal. There is no greater therapeutic agent known to man in the field of mental hygiene than the application of the doctrine of the atonement.

The Application

When the guilt reaction is a symptom of a psychosis such as involation melancholia or manic depressive psychosis the patient should be referred to a psychiatrist for treatment, just as a patient with cancer would be referred to a surgeon. In such cases the sense of guilt has no basis in reality. The depressed patient feels guilty in an exaggerated way and may ascribe to himself a host of sins which he has never committed. Such patients are in need of active psychiatric treatment, such as shock therapy, psychotherapy, and occupational therapy, etc. It may be noted in passing that there is no promise in the Bible that believers will be exempt from mental or physicial illness. The rain falls on the just and the unjust alike.

Where there are no evidences of organic change such as retardation of speech or thought or decreased psychomotar activity or agitation, when the sensorium is clear and the reasoning power unaffected, and when, indeed, there is obviously no psychosis present, then the minister or the psychiatrist can point to the blood of Christ as the only means by which the guilt complex may be resolved. The writer knows of one psychiatrist who is not a believer. This man, however, frequently uses the doctrine of the atonement as a therapeutic measure in his clinic, simply because he has found that it works. For the Christian psychiatrist, however, there is much more involved than the purely therapeutic aspects of the problem. The eternal salvation of a human soul is of far greater importance than any temporary relief of symptoms and it would be a sacrilege to employ the Gospel for any lesser purpose than the glory of God.

Only God can forgive sins and only He can heal the broken heart. Even Zilboorg (8) seems to realize this when he states, "The principle is a simple one: we want to relieve our patients of the sense of guilt for things they have never really or wittingly done, and we leave them with the conscious sense of guilt for things they have really done. As a matter of fact, we could not relieve them of this real sense of guilt even if we wanted to. Those who impute to us the possession of this magic power do so only to attack in us the figure of their own imagination of what a psychiatrist or a psychoanalyst is. The purely clinical manifestations of moral values have as a rule nothing to do with real moral values. They are guilts expressed in terms of moral values. Real moral values are nonneurotic; they are healthy. It may be added that Gregory Zilboorg's contributions to the psychiatric problem of the guilt reaction are perhaps the best that have appeared in recent years on this subject.

We see then that the Christian psychiatrist can make an important positive contribution in his chosen field by the application of the doctrine of the atonement in dealing with the problem of the guilt reaction. With the knowledge of sin forgiven and with the assurance of salvation there comes complete release of tension to the tortured soul. Anxiety and fear are abolished and into the heart of man is born "that peace which passeth all understanding." (Phil. 4:7) Then, and only then, is it possible to forget "those things which are behind" and to reach forth "unto those things which are before? (Phil. 3:13) in the Christian life. This is true mental hygiene.

References

(1) Longfellow: Song of Hiawatha. Introduction, lines 88-90.

(2) Zilboorg: Digest of Neurology and Psychiatry, April 1950, p. 226.

(3) Johnson: Psychiatry and Religion. The Beaton Press, 1948, p. 126-128.

(4) Kinsey: Psychiatric Quarterly, 1949, p. 790.

(5) Zilboorg: American Journal of Psychiatry, April 1950, p. 747.

(6) Christie: Canadian Bar Review, November, 1949, p. 1055.

(7) Bain: Scientific Monthly, July, 1947, p. 68.

(8) Zilboorg: American Journal of Psychiatry, April 1950, p. 747.

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Comments on THE GUILT REACTION

Mr. James Buswell III

Guilt in childhood is not necessarily felt in some cultures, where stealing is condoned, for instance, the stealing of horses among the Dakota Indians, and I would submit that in many cultures where different systems of values hold, that the guilt reaction is not present in connection with the same behavior. We must differentiate between the moral law of God and culturally established systems of value which are purely relative. Therefore, the illustration of sexual indulgence of masturbation, or stealing, although in some parts of the world culturally condoned, do not necessarily give rise to feelings of guilt. The conscience is a function of the learned cultural system of values and the development of the conscience would not be universally the same. The paper is valid, but not universally so. It must be qualified by saying that it applies only to one cultural system of values.

Dr. Marquart

I wonder if a few passages from the scriptures might not sort of clear up some of these points. It is surprising how scripture answers questions in so many of these comparative psychological problems. For instance, we refer to Freud and his super ego, which is only acquired through experience, yet we as Christians must believe that conscience is innate. We are born with a conscience; it is inherent in us from birth, but, according to Romans 2:15, we see that the conscience does not come into operation until after the reasoning -- that is the thought life -- comes into function, which is, we would say then, after the age of three; it is acquired by experience and environment, in accordance with what it says in Proverbs: "Train up a child in the way that he should go and he will not depart therefrom." Dr. Howitt uses the term "conditioned" as though that was the only way we could acquire anything. That wouldn't be good for a Christian to follow. He mentions in some places here how the Freudians indicate that if you suppress these impulses that are within you it will develop a conflict and cause a maladjustment and neurosis. Very often it is just the other way, as Dr. Howitt knows too, and he suggests that he has seen cases--and I have seen them too--that actually developed a neurotic condition because they gave way to the impulses which they should have suppressed. They repressed their conscience, in other words, and you can't do that and get away with it as a human being; it will cause earthquakes in your personality every time. One of the best examples I know is a soldier overseas who did something that he had been trained not to do and he ended up by stealing a jeep in order to get the punishment that he knew he so richly deserved, and he was really a mess until I finally brought him back by 1 John 1:9 to the original belief that he had. He was a Christian soldier, by the way. Similar cases would illustrate how the guilt reaction, when the conscience is repressed, develops all kinds of maladjustments.

Mr. Uuras Saarnivaara

The reason guilt reactions differ among different people is obviously caused by the fact that the knowledge of right and wrong is not innate in them. The conscience does not contain knowledge of what is right and wrong. It is formal in the sense it does not say what is right or wrong, but when we learn what is right and wrong then our conscience binds us to that, so that all the knowledge of right or wrong is learned from other people or from the Bible. For example, cannibals feel that it is their obligation to kill their enemies and eat them. In order that our conscience would be able to react in a proper way it must be enlightened and guided by the Bible--by the word of God--and if we remember this, that the conscience does not contain knowledge of right and wrong, but it binds us to do what is right and forbids us to do what is wrong, if we know what is right and wrong.

Mr. John Wiebe

We sometimes have to own up that our understanding of right and wrong is not always absolutely Biblical, but it is to some extent more or less the way it has been brought down to us from generation to generation. We have to get this understanding of right and wrong. Now there was a missionary who went to South Africa. When he came there he said he was terribly surprised because the negroes would lie all the time--well, practically all the time--no matter if the truth would serve them better, and their byword was "mother you lie; father you lie; sister you lie, preacher you lie", and he said, "Now, let's get together. If you ever catch me telling a lie I will treat the whole crowd, and I will treat them right", and they watched him one week, two weeks, three weeks; it was the biggest shock they ever had in their lives to see a man that always spoke the truth, and he said that was the greatest move to bring them into Christianity. He could leave for two or three weeks, leave all kinds of jewelry on the table, and they would walk back and forth

and wouldn't take a thing. The German saying is, "A young liar is an old thief." That always goes together, but there never was anything missing so he traced back their traditions and he found out that there was a ruling that if anybody got caught stealing he was beheaded, and in many cases before they killed a man they killed both his wife and children to make him suffer as much as possible. Then the British Government came in and stopped it. For this case you get one year in the penitentiary; for that thing you get six months in jail; for this thing six days, and they imported the Chinese and the Hindus and they stole; went to jail for a week or two, and the first thing you knew they were just as well versed on stealing as anybody else.

Dr. Monsma

I would like to make a few remarks in connection with the remarks that were made by Mr. Buswell a while ago about the difference in guilt reaction among different civilizations. Fundamentally, it seems to me that in the human race there is definitely guilt reaction. If you go back to our parents, when they had committed sin we find a deep guilt reaction immediately after they had committed the sin. That seems to have been a normal condition originally of human nature. Now we find that that guilt reaction is missing among certain civilizations. What is the cause of that? It seems to me the cause is sin. The further they get away from God the less the guilt reaction will be. Wherever they are acquainted with God, and where they have his special revelation, the guilt reaction is increased. So, it seems to me that our duty is simply this: the bringing of the gospel, always applied first to acquaint these people with his laws. When they see their sin they will also be willing to accept the mercy of Jesus Christ.

Dr. Eckert

I wanted to ask, does this mean then that we believe the guilt reaction is not an innate or native property, or whatever instinct it is now called; do we accept that as being consistent with the scriptural teachings?

Dr. Monsma

I would like to reply to that. In reformed theology we distinguish between common and special grace and I think that in the human race there is this common grace left, with these various civilizations. We do not have the special grace there of God's special revelation.

Dr. Eckert

What I am referring to is the second chapter of Romans. Aren't we told there that all men become a law unto themselves and that they are judged, first, without the law; and aren't we told subsequent to that that when they by their own conscience do the things that produce a law unto them, they have by instinct a guilt complex, or am I reading something into the scripture?

Dr. Monsma

In some of these areas they do not have a guilt complex for the same reasons we do. In fact, it is pointed out if they don't have a guilt complex for going out and stealing horses they do have a guilt complex for something else. There is that basic guilt complex. Why does anyone feel guilty about doing anything which for some reason or other in their civilization has been forbidden? The point is, when you go back to the beginning, that there was a command of God that they were not to eat before there was any falling away. When they did it they recognized the fact that they had transgressed that command. It seems to me the guilt complex

grows out of that. If there hadn't been any command there wouldn't have been any transgression, so it seems to me the specifics to which they come to be attached, as pointed out as the proceed of learning, civilization, and covered by a great many things, and what they feel guilty about isn't the important thing.

Mr. Buswell

The fact that these other cultures which have guilt reactions on different things is not so much they have less or more guilt reactions than our culture but that they are governed by different cultural values. It is true also that the guilt reaction of Adam and Eve would not seem to be so much instinctive as learned from the command of God. Dr. Howitt's examples were brought as bearing universally, and my criticism was that those examples applied only to our own culture, not that there wasn't guilt reaction in all mankind.

Dr. Monsma

I think I would agree with Mr. Buswell on that. The example of the boy who feels a guilt reaction on stealing cookies, I think all depends on whether he is allowed to take the cookies. When he comes in after school, or any other time, he can take a cooky, and that is perfectly all right; when the cooky jar is empty he doesn't have any guilt reaction; he says, "Mother the cooky jar is empty." Of course, here is the thing we have to bear in mind: Psychologically sometimes it is impossible to trace back and find out where the youngster ever got the idea that he should not do certain things. Sometimes you can't trace them. Your own youngsters come around and they have certain reactions, too, that you have never taught them. Maybe some neighbor child is not allowed to do a certain thing, so they get the idea that maybe they shouldn't do it. So I think the examples myself often were not very well chosen; didn't really illustrate the point he was trying to make.

Dr. Marquart

The guilt response is a better term than guilt reaction. The Pygmies know what is right to do but they cannot do it. That is almost a Christian concept. On the other hand, there are other people that have so far been distorted away from the usual guilty reactions that we saw even in Adam, that they feel perfectly complacent as long as they have a necklace about their necks and nothing else on; they think they are perfectly dressed up and that, of course, is quite a distortion away from what one would ordinarily find among human beings. The guilt response is susceptible to a great deal of change acquired through the environment.

Mr. Wiebe

The Lord God said to Adam and Even, you shall know right from wrong. They knew from then on right from wrong, and what did they do the first thing? They tried to cover it up, hide away, flee away from God. Nobody had told them anything of salvation yet. God came after and told them there would be a Savior coming. They had fallen very deep from God but they still had a certain amount of the image of God in them and had to be saved, and the difference between right and wrong and their conscience started bearing right then and there. Take a small child that never has been with anybody else but probably father and mother, never seen any deceived; the first time he tries to do something he is going to try to keep it secret, and there his conscience is going to beat whether he has been forbidden or not. Satan is already working before anybody else has had a chance to have an influence on him.

Mr. Uuras Saarnivaara

We all know that guilt reactions or general activity of conscience depend on several factors. The ability to have the guilt reaction on the activity of our conscience is inborn. The second factor is the knowledge of right and wrong, and it is known from various sources, like the social customs and training and Christians and the Bible, but the third factor in the activity of the conscience is the fact that if man acts against his conscience, first his guilt reaction is strong, but when he acts against his conscience again, it weakens and weakens and, as the Bible says, the conscience is hardened, it becomes dull, and this, of course, due to the fact that the spirit of God has left and leaves man when he continued to be disobedient, and activity of the conscience is aroused again by two factors, namely, the knowledge of right and wrong, and it is because of that the law of repentance must be preached; and the second factor is the presence and working of the Holy Spirit. The knowledge of the law of God does not cause much guilt reaction unless the Holy Spirit makes the law effective in the conscience, but the law works only guilt reaction on fleeing away from God, as it did in Paradise, and the gospel is needed in order that the conscience would be released from guilt and that we would be able to trust in God and not flee away from him because of our guilt. So this innate and habitual sinning, and the preaching of the law, and the work of the Holy Spirit, all of them belong to the activity of the conscience, as we all know.

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EXPERIMENTAL EVIDENCE FOR THE FORMATION OF SPECIES WITHIN THE PLANT KINGDOM

Dr. O. J. Eigsti
Plant Geneticist, Funk Hybrid Seed Company, Bloomington, Illinois

For centuries man has been aware of organic diversity among living plants and animals. The facts of such diversity are set forth in Biblical records.* Practical students of agriculture depend heavily upon that inherent diversity which is so noticeable among domesticated animals and plants. Not only the scientist, but philosophers and artists as well, have given specific consideration to the problem of variability among populations of living things. Since such a wide interest is attached to this problem we find ourselves engaged in discussion today dealing with organic diversity as illustrated by the various species of plants and animals that inhabit the earth about us. At the same time, man has been forced to recognize the similarity between many plants and many animals, respectively. The cases of transmission of familiar traits from one generation to another are well documented. Thus, we observe two fundamental biological principles; (1) Organic diversity or variation, and (2) organic resemblances, that is, the hereditarily transmitted characters of likeness from one generation to the next.

Every individual plant and animal differs from any other coming before or after. This unrepeatability of the individual is one point upon which all of us agree. The arguments of such a problem may be those of the artist and philosopher, however, the scientist's attention is drawn not only to unrepeatability but also to repeatability of certain aspects of individual characteristics. Stated in other terms, variation and heredity become the basic principles of a discipline known as GENETICS. Nineteen hundred fifty marked the fiftieth anniversary of this subject and any topic such as we present today falls in the scope of appropriate commemoration.

* See Genesis, Chapter 1.

Geneticists constantly seek a better understanding of those phenomena basic to heredity and variation, that is to say, the resemblances and differences between and among individuals. As a result of an honest search for truth, tremendous amounts of factual evidence have accumulated. Today, all educators must instruct within the sphere of these and other data, if we are to meet the need of young people eager for more knowledge about the world in which we exist.

Anyone can demonstrate readily the reality of variation among plants and animals. Such variation may be discontinuous and significant from the standpoint of phylogenetic relationship. A child at the zoo finds little difficulty distinguishing between the pet pussy cat FELIX DOMESTICA and the fierce lion FELIX LEO. One may say these kinds of cats represent two clusters of individuals, thus, any lion is different from any pussy cat. Moreover, each species forms a visibly distinct group. Finally, within each of the groups, the pussy cat to a certain child may mean one particular cat not only different from lions but all other cats. The universality of these observations can be extended to living plants and animals throughout the world. We are able to estimate, with confidence in our judgment, that more than a million species of plants and animals exist today as illustrated by such clusters as the lions and pussy cats.

Much argument and discussion may attend the placement of a species into biological relationship with another. Theories have been postulated to explain phylogenetic origin of species and phylogeny generally. These theories have touched off bitter controversies. Some of the basic causes of species formation yet remain utterly mysterious. On the other hand, we have accumulated a fund of knowledge about certain groups of plants that clearly point the way toward an understanding of speciation within certain areas of the plant kingdom.

Karl Linnaeus, the great Swedish Botanist, devised our present system of naming species. His concept of the origin of species was that of a creation by a divine and direct act. After a time, he discovered that certain species of plants were definitely the offspring of two other parental species which he had previously named. Thereupon, he realized the necessity for a revision of his concept of species-origin. Linnaeus did not, at the same time, discard deep religious belief in God and creation when he realized the need for revision of his earlier opinion about origin of species. The facts of hybridization, which in some cases accounts for the development of new clusters of individuals, are inescapable, if one makes any serious study of genetics and cytology.

Gregor Mendel, an Austrian monk, discovered the basic laws governing variability and resemblances between parents and offspring. The rediscovery of Mendel's laws in 1900 marked the beginning of our present half century which we celebrated in 1950. He followed certain characteristics of the garden peas from generation to generation and formulated genetics laws which have had a profound influence upon thinking in many of the biological sciences. We may illustrate the impact of Linnaeus and Mendelian concepts in the following case. Datura stramonium the Jimson weed is a good Linnaean species, well known to many as an objectionable weed in field and pasture. This species is characterized visibly by purple flowers, purple stem and spiny capsules. Another species Datura tatula, the white flowered Jimson weed, has green stems and is visibly distinct from the purple Datura. According to Linnaeus' early concept the two species represented separate creations. Now the application of Mendelian laws gives us new insight, because the hybrid of a yellow flowered plant, D. tatula with a purple flowered plant D. stramonium, always yields all purple flowered plants. If we self fertilize these purple hybrids the offspring may be both yellow-flowered and purple-flowered plants. The differences are associated with different genes at certain loci on certain chromosomes. Then the basis for speciation is found in the gene changes or mutations that occur and are transmitted from one generation to another.

Within the last 25 years we have demonstrated that gene and chromosome-diversity (mutations) can be induced by physical and chemical agents, i.e. x-ray and colchicine, respectively. The consequences of these studies have direct bearing on our present knowledge of species formation.

In the spring of 1937, experiments conducted at the Carnegie Institution, Department of Genetics, Cold Spring Harbor, Long Island, New York, proved that a drug called colchicine when applied to actively dividing cells caused the number of chromosomes to accumulate within individual cells. New tissues arose from the treatment wherein cells carried a duplicated number of chromosomes. Onion root tips regularly have 16 chromosomes per cell, but the colchicine-treated root tips showed cell conditions with 32 and 64 chromosomes, and in some cases, cells had 500 chromosomes per nucleus. When the drug is applied to young seedlings, a new type of plant with double the number of chromosomes may be obtained. These behave differently from the original untreated plants. These are called polyploid plants. Among flowering plant species over 50% known for chromosome number belong to the category of polyploids and undoubtedly arose in nature by some kind of doubling of the chromosomes before or after specific hybridizations.

Further experimenting with colchicine revealed that a sterile species-hybrid when doubled became fertile and as such became a reproducing unit or population that did not previously exist. We may illustrate these principles by the following actual experiment carried out by two different scientists, independently. Two species of cotton, asiatic diploid G.-arboreum, a 26 chromosome species crossed by another, American diploid, G.-thurberi, also with 26 chromosomes, yields a sterile-hybrid (G. arboreum x G. thurberi). All cells of the hybrid have 26 chromosomes and no flowers of such plants set seed. When colchicine is applied to growing stem tips, new tissues develop that have cells with 52 chromosomes. Now, these new tissues produce flowers that set seed. Furthermore, one may also use these fertile flowers for crosses with standard varieties of American cultivated cotton G-hirsutum, a 52 chromosome species. The species-hybrid (G. arboreum and G. thurberi polyploid) and American cultivated cotton may be crossed without difficulty. We may say that a synthetic species, G.-hirsutum synthetic is thus created. Hence we may obtain by experimental procedures, a synthetic species that simulated a Linnaean species and theoretically recognized by Botanists as a reproduction of that found in nature. Time does not permit to review many other documented cases of genetic experiments which have led to the production of synthetic species very similar to those formed in nature. Such origin of species in nature is postulated as the "cataclysmic origin" of new species. Many crop plants of economic importance are ploypoid, and fit a similar pattern as for cotton. Not all speciation has occurred in this manner but these illustrations are excellent and are scientifically documented. We may go a step farther and hybridize a radish with a cabbage. The hybrid is, as to be expected, sterile, but by duplication of the chromosomes with colchicine, a fertile radish-cabbage plant may be obtained. We must assign the name Raphano-brassica to this creation. Again, (wheat X rye) hybrids can be doubled and from such experiment arises the Triticale or a new wheat-rye hybrid different from either wheat or rye. Numerous additional cases are being studied so that hybrids made fertile with colchicine are of common occurrence. To date, 165 synthetic species have been made with colchicine.

The mechanisms which operate in nature to establish species are complex and outside the sphere of our limited time. Nevertheless geographic isolation, ecological and physiological factors play a very fundamental role in speciation in nature.

Our problem now becomes one of orientation of this newer knowledge with Biblical records that describe the origin of living plants and animals. When we use the

word creation we are not replacing the Scriptural teaching by present scientific laws. The basic genetic mechanism and the gene complex or origin of genes remain as that which was created. We have merely enlarged our concept of how different plants or individuals come into being once the basic gene system was derived.

Summarizing the area covered in this discussion, we have shown how new species of plants may arise by hybridization and subsequent doubling of chromosomes to form new reproductive units. These fit the status of a new species. Our interpretation of Biblical accounts of the origin of plants and animals must take into consideration the accumulated factual evidence provided by genetic investigation, if we are to make effective presentations to students entering the field of biology.

There is no conflict between the genetic evidence at hand and Biblical records. Organic diversity is clearly stated in the Bible and organic diversity is observable. Organic similarities are outlined in the text of Scriptures and these are explained from careful genetic investigation. The explanation of speciation appears sound as viewed from the vantage points of science and religion. I trust that this brief survey can be used for better understanding by those earnestly seeking to continue sincere religious belief and also pursue scientific investigations dealing with the controversial biological materials of phylogeny and phylogenetic relationships.

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MODERN PHYSICAL SCIENCE IN THE BIBLE

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I have in my possession a very old book, a really ancient book, one of the few great books that have survived thousands of years, and practically the only ancient book widely read today. I happen to have this book in very excellent English translation - several, in fact, - and moreover I have carefully read this book and many parts of it I have read many times. Being somewhat a student of physical science I have noted with interest allusions in it to physical science, and that they make sense in terms of modern science. Indeed, some are more understandable and more significant today, I believe, than when they were written.

Without some thought of supernatural revelation, this is rather astonishing, for one would expect any references in ancient manuscripts to science of any sort to be very primitive and hardly anticipatory of modern notions. One would expect to find statements very much in error, based entirely on knowledge and superstition current at the time of writing. One would hardly expect to find ideas which up to the time of writing no one had the possible means of discovering or substantiating.

The Bible was not written to be a science text book or a science book of any sort. It is largely history, biography, poetry and philosophy. In poetry and philosophy we may well expect to find abundant references to nature, but to discover that references to physical science make sense when laid side by side to statements in modern text books may not only be a bit surprising at first thought but certainly heartening and faith-building. If one should be tolerant in requiring that the inspired Scriptures be scientifically accurate he might be inclined to overlook errors on the grounds of literary purposes, and the necessity of using the science currently in vogue in order to be understood at the time of writing by contemporaries.

It is really a large order to require that the Bible written thousands of years ago stand up on the level of science today and still to have made sense at the time of its writing. Imagine writing a book today of this sort anticipating science a thousand years from now (even a hundred) and yet making it understandable now! But this has been done in the Bible, and only its Author could do that. And it is a matter of words.

To me the most marvelous thing in the universe aside from God Himself is language, the structures of ideas built of words. Let us think for a minute how important words are. "In the beginning was the word, and the word was. . . God." How did things come into being? He spoke and it was done. "Let there be light" - four words and there was light. "Let there be" "and it was so." Back of matter, energy; back of energy, words; back of words, God. John the Baptist said, "I am the voice (words) of one." It's a new thought to me, but might it be that language is the chief or only aspect of the divine image? At least, the intelligent use of language or words marks the unbridgeable chasm between man and the rest of the animal creation. Moreover language is man's most difficult tool, a divine tool.

We hear or read some words. Now what did the author have in mind? I noticed that there was some difference of opinion as to the interpretation of papers read here, and both written and read very well. Many years ago the Lord wrote a paper (The Bible) and it was to be understandable in all ages, in all languages. It is a heartening thing to learn that it is so.

What is known today in the fields of modern astronomy is the product of research using the marvelous giant telescopes, the ingenious spectroscopes, and their various adaptations, also advanced mathematics, and physics none of which were had five hundred years ago. Now what did Moses have of all this? Isaiah, Nehemiah, the Psalmists, the gospel writers, and Paul? Nothing!!

Then tell me, if you can, how these men anticipated our present day in their references to physical science. Explain, if you can, how they knew accepted truths today without the physical or intellectual means to discover them. "God knew", you say, "and all He needed to do was to reveal them, doubtless to the astonishment of the writers themselves." Knowing experimentally that these things are so, it is we who can be astonished today, not at the truths, but at the writers.

What writers, on their own, would stick out their necks and make reckless scientific speculations for literary effect and risk becoming the laughing stock of future generations? Swift did that, and I read an article just lately showing how Swift's biology is impossible in Gulliver's outrageously big and little people. Of course, Swift was just in fun and therefore he gets by. The Bible writers were not in fun, but exceedingly serious, and grotesque errors would have been ruinous to their reputation for integrity. But then they were not on their own.

Enough by way of introduction.

I have read through the Bible to find all the references to physical science, and I have listed 325, mostly to astronomy. I want to present a few of the more striking ones.

Immensity yet Finity of Universe

About twenty years ago, Sir James Jeans of England, famous astronomer and physicist, estimated that the number of the stars was of the same order as the number of sands on all the seashores of the world. To my knowledge this estimate has not been seriously challenged up to the present time. This estimate was based

on sampling photographically the regions of the sky.

This estimate is also in the Bible.

God told Abraham, "Look now toward heaven, and tell the stars, if thou be able to number them," and he said unto him, "so shall thy seed be." Gen. 15:5. Whether Abraham ever made a count of the stars I do not know, but if he did, he might have said to the Lord, "You mean my descendents shall number about seven thousand", for that is about the number of stars that can be distinguished with the naked eye. Well, if they would all live at the same time, they would hardly make more than a small city and far from a great nation.

Still later God told Abraham that his descendents would be as the dust of the earth. Gen. 28:14. Surely the dust of the earth would be at least as much as the sand of all the seashores. All we need to do to establish by the Word Jeans' estimate is to apply an axiom.

It appears to have been a common idea among people even up to the present time that the stars are rather insignificant things and that there are not very many of them, just little lamps hung from the celestial dome, lit by night and snuffed out by day, and if all were collected they would make a rather unimpressive pile at the foot of old Carmel. To make all these little lamps that hand in the sky would have been not too big a job for a dozen or two dozen human lamp makers.

Whence, then, came this idea of so many stars long ago? The Hebrew writers somehow got a really impressive view of the heavens, and also of their God. When the children of Israel entered Palestine, the heathen nations were inquisitive to know who their god was. They replied, "He who made the stars!" This God very likely did not impress the heathen, if he made only the stars and probably impressed only few of the Hebrews themselves or they would not have lapsed into idolatry so easily. But the writers of the Old Testament not so. The heavens were revealed to them a very significant part of the creation.

"Thou art the God, even thou alone, of all the kingdoms of the earth; thou hast made heaven and earth!" II Kings 19:15

"Thus saith the Lord that created the heavens; he is God." Isa. 45:18

"Thou art the Lord, even thou alone; thou hast made heaven, the heaven of heavens, (the galaxy of galaxies, or megagalaxy) with all their hosts." Neh. 9:6

"By the word of the Lord the heavens were made, and the host of them by the breath of his mouth. He spoke and it was done." Ps. 33:6,9

"The heavens declare the glory of God." Ps. 19:1

"Thus saith the Lord, the heaven is my throne, and the earth is my footstool." Isa. 66:1 (The earth is insignificant compared with sky.)

<u>A sense of vast distances may be disclosed by the following</u>:

"Is not God in the height of heaven? and behold the height of the stars, how high they are!" Job 22:12

"As the heaven is high above the earth so great is his mercy toward them that

fear him." Ps. 103:11

Compare the conception of the builders of the Babel tower.

Thus saith the Lord, "if heaven above can be measured, I will also cast off all the seed of Israel." Jer. 31:37

"Lo these are but the outskirts of his ways;" Job 26:14 R

The finiteness of world - inhabited space are hinted at here:

"They come from a far country, from the end of heaven" Isa. 13:5

"Who....meted out heaven with a span: (A. U., light year, or parsec)

"He telleth the number of the stars." Ps. 147:4

A few modern astronomical notions are suggested:

Moon

"Behold even the moon hath no brightness, and the stars are not pure in his sight." Bildad Job 25:5 R

Solar Eclipse

"And it shall come to pass at that day, saith the Lord, that I will cause the sun to go down (in) at noon, and I will darken the earth in the clear day." Amos 8:9

Sphericity of the earth

"It is he that sitteth upon the circle of the earth." (sphere) Isa. 40:22

Universal law

"Knowest thou the ordinances of the heavens? Canst thou establish the dominion thereof in the earth?" Job 38:33

"The ordinances of the moon and of the stars." Eze. 31:35

"Thy faithfulness (Law-enforcement) shalt thou establish in the very heavens." Ps. 89:2

"He....upholds the universe by His all-powerful word." Heb. 1:3 W

"He is before all things, and in and through Him the universe is one harmonious whole." Col. 1:17 W

Red Shift

"For all proceeds from Him." Rom. 11:36 W

Obscurations of the Heavens (Dark Nebulae)

"It is he that buildeth his chambers in the heaven." Amos. 9:6 R

"He closeth in the face of his throne and spreadeth his cloud upon it." Job 26:9 R

"I clothe the heavens with blackness, and I make sackcloth their covering." (coalsacks) Isa. 50: 3 A

"He sealeth up the stars." Job 9: 7 (dark stars)

"Oh that thou wouldst rend the heavens, that thou wouldst come down!" (draw aside the curtains) Isa. 64: 1

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MEMOIRS OF A CONVENTION

An unexpected assignment to write up a convention that took place six months ago seems at first to be a rather futile one. But retrospect gives unique opportunity to judge what has proved worthwhile, and so these thoughts have taken shape to renew happy memories and the stimulation of our Goshen Convention.

A college campus: The very atmosphere of Goshen College was conducive to feeling "at home." From the first hour that license plates from many parts began to adorn the parking lot one had a sense of appropriateness of surrounding. The welcome extended verbally to us by Dr. Kreider was backed up by the many gracious actions of our hosts, and our accommodations were ideal. So it was natural that the heavens should weep for us when we had to leave!

That sm-oo-th quality: It was delightful to experience the sense of quiet organization behind the events of each day. The co-ordination of papers by topics was typical of the integration we experienced in every phase of the convention. And all for so little personal expense.

--and the furniture: What a relief to listen in comfort to our colleagues instead of squirming on hard chairs. We were grateful, and intellectualism was abetted by physical well-being.

Naturalists all: The innovation of anature hike in our program met with enthusiastic response, both before and after. So, of course, did the picnic supper which followed it at Goshen's Michigan camp grounds. What better setting could there have been for Dr. Schrock's very practical consideration of conservation? The sweet singing of Mr. and Mrs. Elam Kurtz, and Professor Gathercoal's kindly remarks closed the evening--that is, for most of us. A certain distinguished engineer from Purdue, attempting to follow Dr. Bender's "explicit directions" to the campus, proved his originality instead by becoming rather familiar with southern Michigan by starlight. He arrived somewhat after hours.

A doctor speaks: Very many friends from the surrounding communities gathered to hear the address of Dean Stanley Olsen, and also to see Mr. Everest's lumbering sea elephants (via motion pictures). Incidentally, the size of the group testified amply to the excellent publicity activity of the local committee.

Of historical interest: Not us, but the Mennonite Historical Library. We were glad for this opportunity to see rare books and documents and to learn something further about our Mennonite friends. It was another convention highlight.

A strong spirit of participation: Discussion following the various papers and in the business meeting was in a lively key--an encouraging symptom of organizational vigour. The implications of the apologetic for which we stand received a merited share of attention. It seemed to this reporter that our scientific calling needs emphasis in our meetings, lest we only labour to vindicate our "pet ideas."

However, there was:

A sense of achievement: A post-convention chat with our president indicated satisfaction that all of us had been stimulated in some realm or other. Following retrospect, the question comes: "What have I done about following up the ideas God sent me last August?" The real value and meaning of our convention can only be measured in the light of our answer to that question. May our gatherings continue to make us serve more fittingly the Lord we know and love. See you at Shelton College!

Cordelia Erdman

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