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

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NEWS OF MEMBERS

DR. GEORGE R. HORNER of Elat par Ebolowa, Cameroun Francois, West Africa, wrote a very interesting letter to the secretary on September 28, 1951. He is still interested in our work and says that he may prepare a paper for us for our next annual meeting.

DR. JON H. ROUCH sent us an interesting clipping concerning his work in France while preparing for the mission field. At a Youth for Christ Rally the picture "God of Creation" was shown and at that time over 15 decisions for Christ were made.

MR. WILLIAM J. SCHEPP of East Paterson, New Jersey, is answering puzzling problems in the field of Surface Chemistry according to an article in the Morning Call for November 16, 1951. Mr. Schepp writes this office that after witnessing to a Jew the reporter from the Paterson Morning Call asked to have an article concerning his work published January 3, 1952. In this Mr. Schepp explains, "My task is to open up the Bible, as a layman to other laymen. All I do is to relate what the Bible says to scientific truth, and see what is compatible. To my mind, the Bible must be respected as the Word of God, or it must be disregarded."

We are very happy to announce that DR. J. LAWRENCE KULP, Vice President of the A.S.A. was awarded the $1,000 Newcomb Cleveland prize by the American Association for the Advancement of Science as author of the meeting's most noteworthy paper. The paper was on the subject of "Ocean Depths and Speed of Movements."

Among other things DR. KULP says: "Although the ocean-dating work is still too preliminary to draw valid conclusions, the early tests show that deep ocean circulation is a far slower movement than previously believed. It apparently takes centuries rather than just decades to travel any great distance."

NEW MEMBERS

PHILIP F. ASHTON, of Seattle Pacific College, received his A. B. degree from the University of Washington and his Ph.D. from the same. His home address is 3217 Fifth Avenue West, Seattle, Washington.

MISS MARGERY MAY CHAN, Chairman of Department of Education of Shelton College, New York City, received her M. A. degree from New York University in June, 1948, and is at present a candidate for the Ph.D. degree. Her home address is 80-45 87 Rd, Woodhaven 21, New York.

EDGAR M. CLEMENS, at present employed by the K. U. Christian Day School in Belleville, Pennsylvania, received his B. A. degree from Goshen College in 1950. His home address is 47 W. Summit St., Souderton, Pennsylvania.

MISS MARY KATHERINE CRAGER is employed by the Mennonite Central Committee and is located at Pati, Java. She received her B. A. degree from Goshen College in 1946. Her home address is 620 East Adams Street, Morton, Illinois.

HARRY KEITH CRESSMAN is employed by A. J. Shantz, Ltd., of Hespeler, Ontario, as a chemist. He received his B. A. degree from Goshen College in 1948. His home address is 58 King Street, Elmira, Ontario.

FRANK O. GREEN, Associate Professor of Chemistry of Wheaton College, received both the M. S. and Ph.D. degrees from Northwestern University. His home address is 219 South Chase, Wheaton, Illinois.

WALTER R. HEARN, instructor in Biochemistry at the Yale University School of Medicine, received his B. A. degree from Rice Institute and the Ph.D. degree from the University of Illinois. His home address is One Maple Street, New Haven, Conn.

OLIN CARROLL KARKALITS is employed by the American Cyanamid Company in the Calco Chemical Division. He has a B. S. degree from Rice Institute and M. S. and Ph.D. degrees from the University of Michigan. His home address is 132 Oak Manor Parkway, South Plainfield, New Jersey.

PAUL A. LEATHERMAN, employed by M. Simon Zook, an excavating contractor of Honey Brook, Pennsylvania, received the B. A. degree from Goshen College in 1944. His home address is 322 Main Street, Akron, Pennsylvania. From 1945 to 1948 he did relief work under the Mennonite Central Committee in Puerto Rico.

EARL R. LEINBACH is at present an intern in the Receiving Hospital at Detroit, Michigan. He received the B. A. degree from Goshen College in 1946 and M. D. degree at the Indiana University School of Medicine in 1951. His home address is 7567 Hanover Street, Detroit 6, Michigan.

MELVIN J. LOEWEN is now attending the University of Minnesota. He received the B. A. degree from Goshen College in 1949. His home address is Steinbach, Manitoba, Canada.

EARL S. McCOLLEY is employed as chief chemist by the Celanese Corporation of America. He received the Ph.B. and A. M. degrees from Brown University and the Ph.D. degree from Boston University. His home address is 1035 Bose Avenue, Rock Hill, South Carolina.

MERVIN D. NAFZIGER is at present a medical technologist in the Samaritan Hospital of Nampa, Idaho. His present address is 704 Fern Street, Nampa, Idaho. From 1946 to 1947 he did relief work in Puerto Rico.

MYRL A. NAFZIGER is at present a student in Northwestern University Medical School. He received the B. A. degree from Goshen College in 1950. His home address is Hopedale, Illinois.

JOHN FRANCIS RIES is at present an Asst. Professor of Mathematics at Kings College at Kings College, Delaware. He received the A. B. degree from The Kings College, the M. A. degree from the University of Delaware and the B. D. degree from Faith Theological Seminary.

TITUS WEAVER is employed as a chemist by The Ohio Leather Company. He received the A. B. degree from Goshen College and has taken additional graduate work in the Ohio State and Case Institute of Technology. His address is 521 N. Ward Avenue, Girard, Ohio.

ROBERT EDWARD WEINMAN is at present a student at the Dallas Theological Seminary. He received the B. S. degree from University of Pittsburg in 1950. His home address is 443 E. Burgess Street, Pittsburgh 14, Pennsylvania.

MISS FRANCELLA WOODS is working toward a Masters Degree at the University of New Hampshire in the field of zoology. She received the B. S. degree from the same university in 1951. Her present address is Howe Street, Rochester, New Hampshire.

ROBERT G. ZIEGLER has his B. A. and M. S. degrees from Oregon State College which he received in 1948, majoring in chemistry. His present address is Grass Valley, Oregon.

ASA NEWS AND ANNOUNCEMENTS

The following committees have been approved by the Executive Council for the Seventh Annual Convention of the A.S.A. to be held at the Black Hills Science Station of Wheaton College, August 26 to 30 inclusive:

General Chairman
Donald Boardman

Committee on Papers
Cordelia Eerdman Dr. Marquart
B. P. Sutherland Frank Houser

Committee on Arrangements
Paul M. Wright with the members of the Black Hills Staff

Committee on Field Trips
Paul M. Wright with the members of the Black Hills Staff

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References to the two reprints that appeared in the September, 1951, issue of the Journal are as follows:

E. Walter Maunder "Joshua's Long Day" Journal of Transactions of the Victoria Institute 53, 120-148 (1921)

Annie S. D. Maunder "The Shadow Returning on the Dial of Ahaz" Ibid. 64, 83-101 (1932)

- -

CORRECTION to Sermons from Science. The topic of D. Lee Chesnut, 1185 Highland Park Road, Schnectady, New York, was incorrectly given as two topics. It should be one topic "The Atom Speaks--and Echoes the Word of God."

The Editor has received requests for outlines of some of the more important messages. We would be glad to receive your outlines, some of which may be published in later issues.

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MIRAGES ARE LIGHT BENDERS©

PART 1
By
J. Lowell Butler

Do you know that Nature makes it possible for you to see around a corner or over the horizon under certain conditions? A review of what we now know about mirages shows that it is highly probable that a special mirage occurred on Joshua's Long Day, and again in the days of Isaiah and Hezekiah when the shadow of the sundial moved backward ten degrees.

Most of us are familiar with sky-light that is reflected from a layer of hot air close to the surface of a pavement or highway, which gives the appearance of a pool of water in a strange place. But doubtless only a few people have ever seen a lateral mirage or a looming mirage, or even a superior mirage, judging from the scarcity of published material on the subject of mirages.

The word mirage is of rather recent origin; but long before people had a name for this light-bending trick of the atmosphere, these strange sights were seen and occasionally described in writing. Even the Bible contains a few descriptions of mirages, but, of course, without using the word mirage.

Mirages have produced many interesting sights in Nature, and they have fooled people many times. In fact, several of our best modern explorers and men of science have been deceived by them. However, some people are getting wise to these tricky mirages, because they understand them and know how to recognize them. It is now realized that there are several kinds of mirages, just as there are several kinds of clouds. Clouds, for instance, have been given such names as: Cirrus, Cumulus, Nimbus, and Stratus; and mirages have been given such names as: Inferior, Towering, Looming, Lateral, Superior, Perfect, and Supernatural. Just as clouds in the sky may be a mixture of more than one kind of cloud, so also mirages may be a mixture of more than one kind of mirage. If you were to see one or all of these kinds of mirages, could you give each one its correct name? With the help of what follows you will find this easy, and you will realize that the subject of mirages is an interesting and profitable one.

Possibly you can add another interesting example (and we hope, a photograph also) to those which are given here. (See footnote at end of article.)

1. Inferior Mirages

First of all, let us consider the style of mirage that is seen most frequently, the "inferior" mirage. Mirages which are below the horizon, or in an inferior position, are called inferior mirages. This does not mean that they are of poor quality. Usually these mirages look like puddles of water on a hot pavement of highway, or they look like lakes in a field or level desert area, and they show reflections of the objects that are in them and around them. What appears to be the surface of the water often shows moving waves, as though a cool breeze were stirring the surface. On a hot day such a sight is inviting, indeed. These mirages have caused many a desert traveler to wander from his course of travel and perish on the hot dry sands trying to reach the ever receding "water" which he could see so plainly with his own eyes. Many stories have been told which involve the inferior mirage. Here are just a few of them.

In north central Oregon, south of Arlington on the Columbia River, is a large wheat belt where trees are few and far between, and where ducks and geese like to stop and feed during their migratory flights from the north countries. Some friends of mine, Cecil Metzler, Harry Bjure and others from Gresham, near Portland, Oregon, once went on a duck hunting trip to this region and found what they thought was a nice shallow lake of water in the Rock Creek Flats south of Arlington. They could see birds swimming on the surface of the lake, and the bushes were reflected in such a way that it looked like a shallow lake--which makes another ideal feeding place for ducks. For an hour they crawled carefully on their hands and knees among the surrounding bushes, and sometimes flat on the ground, to keep out of sight of the birds and to get within shooting distance. Finally a jack rabbit was scared out of his hiding and went bounding away straight into that lake and across it! It proved to be only a shimmering mirage lake! What appeared to be water, was only a layer of very hot air close to the ground, which, because its density was lower than the air above it, bent the light from the sky slightly upward and made it look like sky-light reflected from the surface of a breeze-swept lake.

Possibly three of the best places to see mirages in the United States are in northwest Nebraska, northwest Utah,[1] and southeast Arizona. More than one kind of mirage may be seen in these places. Probably the best mirages are seen in Utah on the Bonnsville Salt Beds about 125 miles west of Salt Lake City, where they are regular yearly affairs. Gus P. Backman, secretary of the Salt Lake City Chamber of Commerce said in describing them briefly, "The mountains in the midst of the salt beds are known as floating islands due to the fact that it appears that the mountain ranges are large islands completely surrounded by water. These mirages are so commonplace to us in this area that I cannot recall any photographs being made of them." (Letter of June 30, 1951.) Dr. W. J. Humphreys of the U. S. Weather Bureau said when illustrating the inferior kind of mirages, "This type of mirage is very common on the west coast of the Great Salt Lake. Indeed, on approaching this lake from the west, one can often see the railway over which he has just passed apparently disappearing beneath a shimmering surface."[2] These mirages may also be seen from highway 40.

The name "mirage" was not in existence before 1793. In that year Napoleon took an army into Egypt, and one of the members of this expeditionary force was a French physicist whose name was Gaspard Monge. While he was with this expedition, the mirages which the soldiers of France saw in north Africa and Egypt were so plentiful that they "threw themselves on their knees and prayed for deliverance" from the "vanishing lakes, upside-down palm trees and ghostly minarets" which they could not understand.[3] Monge studied these strange sights and came to a scientific conclusion that has stood the test of 150 years. He gave them the name, "mirage," which is from the French word mirer and the Latin word mirare, which mean "to look at." Indeed, a mirage is something to look at --and to study.

April 11, 1916, a mirage caused a temporary cessation of hostilities between the British and the Turks on the torrid plains of Mesopotamia, some distance east of the Bible land of Palestine. The inferior mirage made it impossible for the British gunners to see the fleeing Turks, ans so one of the strangest of military dispatches was written: "The fighting had to be temporarily suspended owing to a mirage."[3,4]

The missionary explorer, Livingstone, described a remarkable inferior mirage which he saw in the northeast part of the Kalahari Desert in southern Africa. Livingstone wrote: "The mirage on these salinas was marvellous. Here no

imagination was necessary for realizing the exact picture of large collections of water. The waves danced along the surface, and the shadows of the trees were vividly reflected in such an admirable manner that the loose cattle, whose thirst had not been slacked by the very brackish water of Ncholetsa, with the horses, dogs, and even the Hottentots, ran off towards the deceitful pools. A herd of zebras in the mirage looked exactly like elephants. Then a sort of break in the haze dispelled the illusion."[5]

2. Towering Mirages

The second style of mirage is the towering mirage, which magnifies the distant objects and distorts them into fantastic shapes and sizes. It may be combined with the inferior mirage, so that the objects on a mirage lake and around it will have strange shapes. These may be seen in both hot and cold lands. Rocks and bunches of grass are transformed into desert villages and minarets; small bushes become large palm trees; and icebergs appear to be large castles with protecting towers.

If the observer is traveling, fantastic transformations of these objects on the horizon are seen. Sometimes they are flattened into a table-land; then they are stretched upward into spires; and then they may assume the shape of a mushroom standing on a slender stem; or portions of the horizon may float off into space and disappear; or now fantastic mountain ranges may appear. "Such antics may go on for hours," making the mountains and hills change position like playing lambs.[6]

The writer of Psalm 29:5-6 was evidently referring to a towering mirage which he had seen in the northern part of Palestine when he wrote, "The voice of the Lord breaketh the cedars; yea, the Lord breaketh the cedars of Lebanon. He maketh them also to skip like a calf; Lebanon and Sirion like a young unicorn." This is mirage language with a religious coloring much more than it is poetic language.

When the explorer and archaeologist Dr. Byron Khun De Prorok became lost for a day in the blistering hot Sahara Desert in north Africa, which is sometimes 158° F., he saw how its heat affected the entire scenery, and wrote, "The world around me became a vague yellow haze, for the heat affects all distances, and forms become greatly disproportioned. Small hillocks in the distance are distorted into mountains; elevations that seem near are perhaps five miles away."[7]

He might have borrowed an expression from the Psalms and said, "The hills melted like wax (Psalm 97:5), because from all appearances in those sweltering surroundings, the hills seemed to be changing form like melting wax objects.

Dr. Roy Chapman Andrews, a veteran explorer and later Director of The American Museum of Natural History, saw a combination of inferior and towering mirages while in northern China in the Mongolian Gobi Desert. The temperature on that day stood at 145° F. From a slight rise he saw in the distance a beautiful lake about half a mile across, and on its surface was a moving flock of birds. Some of the birds seemed to be of the wading variety, with legs that appeared to be about 14 feet long. Some of the birds appeared to have huge flamingo wings, while others had strange shaped squat-like bodies. In the midst of the lake was an island. Even though Dr. Andrews suspected that this was a mirage, he called to his topographer, Major Roberts, to sketch the outlines of it from that position. And then he drove toward the lake to investigate it. Dr. Andrews wrote,

"As I went down the slope the lake became less distinct. The island wavered, then disappeared. The birds proved to be a herd of antelope, all but their heads obscured in the stratum of shimmering heat waves lying on the sand. I drove back to where Roberts was working. The lake appeared again, perfect in every detail. Roberts wouldn't believe it was a mirage until he had gone down to see for himself."[4,3]

Sometimes these towering mirages play strange magnifying tricks with small objects. At one time an ant colony was situated at the sending end of such a mirage, and when seen at the receiving end these ants appeared to be cows moving over a distant hill. One of the cows did a seemingly impossible trick, by picking up another cow in her mouth and carrying it away. While another was seen to fall down a high cliff without injury to herself. This distorted view of the ants was the result of the straight rays of light coming from them being bent irregularily by the heated air through which they were passing, just as they are bent and give us a distorted view when we look through an imperfect window pane or when we look into a cheap mirror with an irregular surface.

3. Looming Mirages

The third style of mirage is the looming mirage. These mirages cause objects and mountains to loom up and appear on the horizon, and remain in contact with the horizon. The views which they present look very natural. The rays of light coming from beyond the horizon are bent somewhat downward by an upper layer of warmer and much less dense air, and we actually see what is ordinarilly out of sight many miles beyond the horizon! It is this style of mirage which has deceived some of our experienced explorers and best scientists.

In 1818 Sir James Ross and his uncle, Sir John Ross, were seeking a Northwest Passage around the North American Continent. When north of Baffin Land one morning they saw what appeared to be a range of mountains that blocked their way, and so turned back. Almost a hundred years later Admiral Robert E. Peary, while traveling up the northwest coast of Ellesmere Island (some 300 miles west of the north end of Greenland), saw during June and July of 1906 from three different locations the snow-clad summits of what appeared to be a mountainous country about 120 miles to the northwest beyond the Polar Sea, and named it "Crocker Land" in honor of one of his supporters. After his return trip from discovering the North Pole on April 6, 1909, his report concerning Crocker Land, together with similar accumulated evidences reported by Richardson, McClure, Marcus Baker, Capt. John Keenan, and Dr. R. A.Harris, awakened considerable interest, and a Crocker Land Expedition costing $300,000 was organized and sponsored by the American Museum, the American Geographical Society, the University of Illinois and many private contributors, and was placed under the able command of Donald B. MacMillan, who was with Admiral Robert E. Peary on his successful trip to the North Pole.

In the summer of 1913 this Crocker Land Expedition established its winter base in Etah in Feulk Fiord, "the most northern settlement in the world,"on the northwest shores of Greenland, north latitude 78° 20' and west longitude 73°, about 700 miles from the North Pole. March 10, 1914, the expedition began its long trip of 580 miles to the shores of the Polar Sea, using sledges and dogs, and reached these shores near Cape Thomas Hubbard on April 11th, after 33 days of continuous work through weather that was often very stormy and from 20 to 30 degrees below zero. Here the party was limited to four men, including two Eskimos, and four sledges drawn by dogs. By April 21st they had traveled about 100 miles

onto the Polar Sea in a northeast direction, and then experienced another of those rare clear and quiet days in the Arctic, which permitted them to see farther on before them a beautiful land with "hills, valleys, and snow-capped peaks extending through at least one hundred and twenty degrees of the horizon.... But as we proceeded," wrote MacMillan, "the landscape gradually changed its appearance and varied in extent with the swinging around of the Sun; finally at night it disappeared altogether. As we drank our hot tea and gnawed the pemmican, we did a good deal of thinking. Could Peary with all his experience have been mistaken? Was this mirage which had deceived us the very thing which had deceived him eight years before? If he did see Crocker Land, then it was considerably more than 120 miles away, for we were now at least 100 miles from shore, with nothing in sight."[9] By April 24th they had traveled 150 miles due northwest from Cape Thomas Hubbard, to north latitude 82° and west longitude 108° 22'; but, wrote MacMillan, "not a thing in sight, not even our almost constant traveling companion, the mirage. We were convinced that we were in pursuit of a will-o'-the-wisp, ever receding, ever changing, ever beckoning..... My dreams of the last four years were merely dreams; my hopes had ended in bitter disappointment."

On the return trip the Crocker Land Expedition had fair weather until shortly after reaching shore. While the weather was clear, quiet and cold, wrote MacMillan, "the mirage of the sea ice, resembling in every particular an immense land, continued to mock us. It seemed so near and so easily attainable if we would only turn back." After reaching land again, they climbed to the place where Peary had built a cairn of stones and seen "Crocker Land," and had another good look at it. Describing what they saw from this high point on Cape Thomas Hubbard, MacMillan wrote, "The day was exceptionally clear, not a cloud or trace of mist; if land could be seen, now was our time. Yes, there it was! It could even be seen without a glass, extending from southwest true to northeast. Our powerful glasses, however, brought out more clearly the dark background in contrast with the white, the whole resembling hills, valleys, and snow-capped peaks to such a degree that, had we not been out on the frozen sea for 150 miles, we would have staked our lives upon its reality. Our judgment then, as now, is that this was a mirage or loom of the sea ice."

Later when commenting on mirages of this and another style, Dr. Roy Chapman Andrews, Director of the American Museum of Natural History, said, "Most mirages occur when layers of air of different density are superimposed. Also, somewhere on the Earth's surface, perhaps a few miles, a hundred, or even a thousand miles away, there must be objects similar to those we see in the mirage. The light waves are bent and refracted irregularly instead of traveling a normal course as they pass from those objects through the layers of air."[4]

This leads us to ask a few thoughtful questions: Are those mountains of "Crocker Land" somewhere in Canada or Alaska? Are they the Stanovoi Mountains of northeast Russia? Or are they somewhere in Mongolia or Tibet? Or do they lie far beyond the North Pole and south of Siberia? Would it be possible to follow that trail of light by fast airplane back to its source and know for sure?

The Antarctic explorer Charles Wilkes, authorized by an act of the U. S. Congress, sailed from 1838 to 1840 along the Antarctic Barrier south of Australia from longitude 150° to 97° East and mapped what he found. That region is still called Wilkes Land; but some of what he mapped turned out to be nothing bu a mirage coast line!

Admiral Richard E. Byrd has flown over both the North and South Poles of the Earth. He has been in the Antarctic three times with able scientists. In 1929 a range of mountains was photographed from a certain position of longitude and latitude.

On a subsequent expedition Admiral Byrd saw these same mountains exactly as photographed previously, but he was then 200 miles farther away from them. They loomed up over the horizon, because the rays of light coming from them were bent downward enough to fit the general curvature of the Earth's surface.

In 1948 Commander Finn Ronne of the Ronne Antarctic Research Expedition had a similar experience, in which he "saw land over the edge of the world, 200 miles beyond" the normal horizon, which is usually only 20 miles away.

In 1927 Colonel Charles A. Lindberg on his famed solo flight from New York to Paris, May 20-21, had to contend with looming mirages several times over the North Atlantic Ocean before he reached the Irish coast. But he was not fooled by them because he knew that he was still several hours flying distance from Ireland.

Looming mirages have been seen on the east coast of the United States, across Lake Michigan from Chicago to St. Joseph, in the central part of South Dakota, and especially across the Gulf of Lower California in the region of Puerto Penasco in northwest Mexico.[10,11] Space will not provide room for the details here. Looming mirages have also been seen at sea and in north Africa.[4,10]

4. Lateral Mirages

The fourth style of mirage is the lateral mirage. When the adjoining hot and cool layers of air are vertical, or at right-angles to the level horizon, they act like a prism or mirror that helps us see around a corner, instead of over the hump of the horizon. When the Sun is shining on the face of a steep slope or cliff, a layer of hotter air is produced that is standing on edge, so to speak. And several people have had frightening experiences because of these lateral mirages.

In Utah a camper was looking at the scenery through his binoculars, and while he was doing this the sunlight produced a lateral mirage on the steep hill on which he was standing. As he lowered his field glasses and looked around he saw a bear walking toward him. Evidently the bear saw him also, and rose up on his hind legs in surprise. The man let out a yell, and the big bear began a hasty retreat. Then the breeze shifted the air and the lateral mirage, and the bear vanished from sight. But a careful investigation around the bend of the trail showed that fresh tracks had been made by a very real bear.

In Alaska a lateral mirage caused Major Frederick L. Martin on his round-the-world flight in 1924 to wreck his airplane. After leaving Chignak in Alaska he flew between some mountains that formed a narrow gorge. A heated vertical layer of air caused him to see the mountains to his left as though they were directly in front of him. He banked sharply to the left to avoid them, and then found himself headed directly toward the real mountains. He realized too late that this lateral mirage had fooled him, and a crash followed; but luckily no one was killed.

The shifting of scenery sideways by a lateral mirage is not seen often. But a story is told of a ship which was crusing near a steep mountainous coast and was seen in one such mirage to apparently divide into two identical ships that then moved away from each other in opposite directions.

5. Superior Mirages

The fifth style of mirage is the superior mirage. These mirages are in a superior position, or above and free of the horizon, and show some sky below them.

These sky mirages may show objects in an erect position or in an inverted position, and the objects soon may be in reality out of sight over the horizon. Superior mirages have been seen by many people in many places.

During the early colonial days of U. S. history a superior mirage was seen from New York one afternoon after a violent storm. A certain sailing ship which was expected from England was seen floating in the air, and so many of its details could be seen that its identity was unquestionable. "That vision, however, was the last ever seen of her."[4] Then in 1918, during World War 1, a German U-boat captain who had ventured into the waters off Sandy Hook took a look at New York City through his periscope, and was greatly surprised at what he saw. A superior mirage showed another New York City upside-down, floating in mid-air over the real city, with the points of the skyscraper buildings touching each other.

In 1869 a superior mirage near Paris showed an inverted reflection of that city to distant observers. And in 1900 the Eiffel Tower looked like two stunting acrobatic twins, with one standing on its head on top of the other.

In 1870 a superior mirage in Europe let many people in Sweden amd Norway see a picture in the sky of the armies that were several hundred miles south engaged in the Franco-Prussian War.

During the Crimean War of 1853-1856, when Florence Nightingale became famous for her heroic efforts in saving the lives of soldiers, there occurred a superior mirage which made the whole British Fleet appear as an inverted picture "at considerable height above the horizon."

What has been called "the most spectacular mirage ever recorded" was seen in 1558 in the Strait of Messina between the Island of Sicily and the southern tip of Italy. It was named "Fata Morgana" and has given rise to a typical fable. It has been seen more than once. When a strange ghostly cloud is formed in the straits, this mirage presents the picture of a harbor-city, or rather two or three such cities one above the other. But "as the Sun rises higher, the fairy city fades in the limpid Italian air." From Japan have come reports of somewhat similar mirages.[12]

Superior mirages are seen in northwestern Nebraska, when the atmospheric conditions are most right. They are preceded by a "gray", rather smoky and unnatural-appearing cloud" that lies on the horizon in the early morning. Soon "pine forests, buttes, and weird castles bedeck a new and higher landscape, which floats majestically above the horizon."[13]

The south polar relief ship, Terra Nova, was seen in an interesting superior mirage by one of the survivors of Captain Scott's last expedition in the Antarctic. While most of the ship was still out of sight over the horizon, and only the masts were in sight, there appeared a complete picture of the ship upside-down in the sky, and over this a second mirage of the ship upright.

6. Perfect Mirages

The sixth style of mirage has been called the perfect mirage. By this is meant a mirage which would bend the light rays of an object completely around our planet. "A lone desert wanderer would be dogged by a constant, life-sized, silent traveling companion---the ghostly image of himself, projected by mirage completely around the surface of the globe." But, we are informed, there is no perfect mirage on our planet. However the scientists tell us that on a planet six times as large as the Earth and with a similar atmosphere of proper hot and

cold temperatures, there could be such a thing as a perfect mirage.[3]

Reader Please Take Note: If you know of any more interesting mirage stories that are authentic, and if you have any reasonably priced pictures of mirages, please send them to the author. If you can take pictures of mirages, please send for some free suggestions that will assist in making your pictures more valuable scientifically. Write to the author of this aritcle, J. Lowell Butler, Route 2, Box 220, Gresham, Oregon.

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MIRAGES ARE LIGHT BENDERS°

Part 2

Mirages and Joshua's Long Day

By

J. Lowell Butler

Mirages help us to understand Joshua's long day, Hezekiah's backward moving sundial shadow, and how "every eye" on a round world can see Jesus coming swiftly in the clouds of heaven.

In the first part of this study of the light-bending qualities of mirages six different kinds of mirages were studied, and numerous examples given. Here is a quick review of them. (1) When the rays of light coming to us from the distant sky are bent upward by a layer of ground air that is a least five degress warmer than the layer immediately above it,[15] we see below the horizon (on in an inferior position) what appears to be a lake of water, which may show reflections of trees and other objects on its shimmering surface. We call this an inferior mirage. (2) Sometimes the rays of light are bent in such a manner that distant objects are stretched upward and appear much taller than they really are. This is the work of a towering mirage.

(3) When a layer of warm ground air extends up to considerable distance above the horizon and is in close contact with a layer of quiet cooler air above it, the rays of light are bent somewhat downward and permit us to see over the horizon. Out-of-sight objects loom up over the horizon as a result of this looming mirage. (4) Likewise we are able to see around a corner or steep hill when we are in a layer of hot air that exists in a vertical position in close contact with cooler air. This produces lateral mirages. (5) Superior mirages are seen higher above the horizon, and may show out-of-sight objects in inverted and erect positions, because of one or more level layers of alternating hot and cold air.

(6) All these demonstrated light-bending tricks of our atmosphere have led scientists to admit that under certain conditions of the atmosphere it might be possible for a perfect mirage to occur, in which the rays of light would be bent completely around a planet.

And this brings us to the study of the seventh kind of mirage, the supernatural mirage. The Creator of the astronomical and meteorological heavens and the Earth knew full well the possibilities that exist in light-bending and light-refracting substances, and it now seems evident that He utilized these latent powers in Nature more than once to accomplish some special objectives.

7. Supernatural Mirages

The seventh style of mirage is the supernatural mirage. This is a special and rare mirage in the Earth's atmosphere which is similar to one or more of the natural mirages, but is of a magnitude, altitude, and character that could be the result of a divine miracle only, and therefore produced for some important purpose. In this style of mirage the higher strata of air may play an important role. At a height of forty miles the temperature of the Earth's atmosphere is about that of boiling water (212° F.), and just below and above this layer the temperature is very cold (0° to -75° F. below it, and 0° to -150° F. above it).[16,17] Convection currents and high winds prevail to an altitude of

some sixty miles. Whether this much of the Earth's atmosphere is involved in the supernatural mirages, or whether such mirages are produced mainly by special changes in the lower strata of air below a height of ten miles, remains to be determined.

One writer has said recently, "Actually, mirages are infinite in their variety. Given the right conditions, there is virtually no limit on the time or place of a mirage, or on the object which may appear."[18]

When we examine the 114th Psalm in the light of what we now know about mirages, it is easy to see that this Psalm contains a description of a great mirage in the land of Palestine after the Jews had crossed the River Jordan in their early conquest of that land. Furthermore, when we compare the 114th Psalm with a list of the recorded miracles which God performed in behalf of the children of Israel from B. C. 1491 to 1451, it is easy to see that this Psalm is referring to these miracles only. And since Joshua's long day occurred only a few months after the crossing of the River Jordan, the mirage described evidently occurred on Joshua's long day, and it was a result of God performing a miracle on that day. In other words, in the 114th Psalm we have a brief or partial description of a supernatural mirage which occurred on Joshua's long day!

What was seen on that day was described by more than one writer, even though no man at that time fully understood that supernatural mirage. Certainly if ordinary mirages have not been recognized by so many people, including some of our best explorers and men of modern science, it is to be expected that a supernatural mirage would likewise be seen but not understood in Bible times. It has been left for our inquisitive scientific age of greatly increased knowledge to analyze the evidences and come to realize that God produced a supernatural mirage on Joshua's long day. In this way the light of the Sun and the Moon were bent downward in a curve that was about parallel to the spherical surface of the Earth, so that as the Earth continued its orderly rotation on its axis, the Sun and Moon appeared to stand still in the evening sky.

Before quoting the 114th Psalm we should refresh our memories with a list of some of the outstanding miracles which occurred between B. C. 1491 and 1451. In delivering the children of Israel from their Egyptian bondage God performed a series of miracles (Exodus 6:1-8; 7:1 to 12:42); He performed another miracle when they crossed the northwest part of the Red Sea, or Gulf of Suez (Exodus 14); He performed a miracle when Moses smote the rock in Horeb, and a great fountain of water was provided for the people in the wilderness (Exodus 17:1-7; Numbers 33:14; 20:1-12); He performed a miracle when they crossed the River Jordan just north of the Dead Sea (Joshua 3:1 to 5:1); He performed a miracle when the walls of Jericho crumbled (Joshua 6:1-27); and He performed another miracle on Joshua's long day (Joshua 10:1-14).

In the 114th Psalm, in the fourth and sixth verses we find the strange descriptive expressions, "the mountains skipped like rams, and the little hills like lambs." This is another way of describing a big mirage without using the word mirage. The word mirage was not in existence then. The short 114th Psalm reads as follows:

"When Israel went out of Egypt, the house of Jacob from a people of a strange language; Judah was his sanctuary, and Israel his dominion. The sea saw it, and fled: Jordan was driven back. The mountains skipped like rams, and the little hills like lambs. What ailed thee, O thou sea, that thou fledest? thou Jordan, that thou wast driven back? Tremble, thou Earth, at the presence of the Lord, at the presence of the God of Jacob; which turned the rock into a standing water, and the flint into a fountain of water."--Psalm 114.

The description of this supernatural mirage in the 114th Psalm seems to indicate that it was a hot-weather mirage, rather than a cold-weather mirage. This is confirmed by the details of the narrative that is given in the book of Joshua.

For instance, soon after crossing the River Jordan the Passover was observed (which occurred during the month of April), and then several other things were done which would have taken a few weeks of time. This places Joshua's long day sometime in summer, probably in June, when in that region the "intense heat" of summer begins.[19]

Furthermore, in reading the story of Joshua's long day (Joshua 10:1-28) we should notice that a very severe hailstorm occurred on that day. Checking this information with several articles in the Encyclopaedia Britannica, we find that the entire narrative is consistent, because hailstorms of this severe character usually occur in the summertime and usually in the afternoon, when the air is generally hot and quiet.[20] It was not until after this severe hailstorm had occurred in the Ajalon Valley more than twenty-five miles west of the north end of the Dead Sea and then moved southward to Azekah some 16 miles southwest of Jerusalem, that Joshua on that day once more showed his great faith in God in a time of special need and said, "Sun, stand thou still upon Gibeon; and thou Moon, in the valley of Ajalon!" Joshua was somewhere east of Gibeon and looking toward the west when he said this, because the battle was progressing westward down the Ajalon Valley and then southward. The day was getting well spent, and more time was urgently needed to complete that important battle against the five confederated kings of the southwest, so that they could not escape by fleeing into the walled villages. (Joshua 10:19,20) And so God honored Joshua's command and timely faith (which he expressed publically without any shadow of a doubt) because they were in line with His plans for the conquest of Palestine at that time. So the simple matter-of-fact record reads:

"And the Sun stood still, and the Moon stayed, until the people had avenged themselves upon their enemies. Is not this written in the book of Jasher? So the Sun stood still in the midst of heaven, and hasted not to go down about a whole day. And there was no day like that before it or after it, that the Lord harkened unto the voice of a man: for the Lord fought for Israel."--Joshua 10:12-14. (See also Heb. 3:11) The expression "hasted not to go down" shows that this lengthening of the day occurred in the afternoon, and probably when the Sun was near the western horizon. All of the circumstances seem to indicate this. What was accomplished while the Sun and Moon stood still is told in verses 16-28. (Verse 15 belongs with verse 43)

Another group of related evidences which we should keep in mind when studying the circumstantial evidences of Joshua's long day is the geographical position of the land of Palestine. Palestine is located in the midst of a great desert area that extends from the Atlantic Ocean across north Africa and Saudi Arabia and into Iran, or Persia, a total distance of about 5,000 miles east and west, and from 800 to 1400 miles north and south.[21] Plenty of hot air could be made over these millions of square miles of desert[22] to produce one of the factors in the atmosphere that is required in making a large mirage. And the extensive cooler waters of the long Mediterranean Sea to the west, and the Atlantic Ocean still farther west, could produce another factor in the atmosphere which helps in making looming and superior mirages. But to get these extensive strata of hot and cool air close together, properly superimposed, and then keep them relatively quiet for several hours would require extensive and appropriate movements of the air over a very large area. Nature left to itself does not accomplish all this.[23] But certainly an all-wise and all-powerful Creator would find it easy to do all that at the proper time, knowing in advance what Joshua would require.

When we reflect on all these evidences, it seems reasonable to conclude that God made a supernatural mirage over the Mediterranean Sea and over Europe and over the north Atlantic Ocean on Joshua's long day: and that is the way God caused the Sun and Moon to be seen above the sunset horizon for many hours after in reality they had set. The light of the Sun and Moon were bent over the horizon as the Earth continued its normal rotation, and what people saw in Palestine was a supernatural superior mirage of the Sun and Moon. It was not necessary for God to stop the rotation of the Earth to cause the Sun and Moon to appear to stand still in the evening sky.

Some people--in fact, many people--have supposed that our spinning planet had to be stopped for awhile to produce what was seen by Joshua and the inhabitants of Palestine. This supposition has stirred up a lot of justified criticism by those who study Nature and know the laws of astronomical motion. Then, those who were all too anxious to find an excuse for rejecting the Bible, thought they had some good reasons here for calling this Bible story of Joshua's long day "incredible," "the product of fancy," "matter of scorn," a "hideous implausibility," a "flight of fancy," a "metaphor," "poetic imagery" and many other uncomplimentary things.[24] By jumping to the conclusion that there was only one way (namely, by disturbing the rotation of the Earth on its axis) for the Sun and Moon to apparently stand still in the sky for some time, both sincere Christians and intelligent scientists have provided the shallow atheists with quite a long day of merriment, ridicule, sarcasm and vitriolic unbelief. As a result, many young men and women have turned away from the Bible, thinking that it was a book of religious fables of the Jews, instead of a Guide Book for truth-seeking souls.

However, a careful reader will notice that there is nothing in the story of Joshua's long day (Joshua 10:1-28) which says that the rotation of the Earth on its axis was stopped. What was seen is described just as they saw it; but how it was produced has been left for our inquisitive scientific age of greatly increased knowledge to discover. It is the study of mirages which sheds light on this and other Bible stories. Again the Bible stands vindicated as a faithful record of facts. Again it can be accepted literally.

Have you ever taken a few moments to reflect on what would happen all over our planet if its turning on its axis were suddenly stopped? The spinning speed of the Earth at its equator is about a thousand miles per hour! Spinning around an axis produces centrifugal force, or a thrust outward from the axis. That is what makes many of the planets, including the Earth, oblate in shape with a diameter which is greater through the equator than through the poles. Strong steel flywheels and emery wheels have been known to fly apart when spun too rapidly. If you should tie a weight, say a pound, to a string and then whirl that weight rapidly around your hand while you held onto the end of the string, the string would break from the outward centrifugal force if the whirling were fast enough. Centrifugal force will also keep water from spilling out of a bucket full of water if it is swung rapidly around you, either horizontally or vertically. The spinning of the Earth produces in the Earth an outward centrifugal force that partly balances the inward pull of gravity. If the Earth stopped spinning, then the outward force would disappear, and relatively speaking, the force of gravity would be increased. This would cause readjustments and much faulting within the rock layers of the Earth, with resulting earth-wide earthquakes which would be severe enough to destroy every city on the entire Earth. Since the story of Joshua's long day does not include mention of any earthquake at all at that time, we must conclude that Joshua's long day was not the result of the Earth ceasing to rotate for several hours. That day was lengthened in some other way, namely, by a supernatural superior mirage of the Sun and Moon.

Another terrible result of any sudden stopping of the spinning of the Earth on its polar axis would be the creation of violent and miles-high tidal waves in the waters of the oceans and large lakes, which would spill over their eastern shores as they continued to travel in their former direction in space. For example, if you were carrying a large flat dish full of water while moving rapidly eastward, and then suddenly stopped, most of the water in your dish would suddenly rush out of it toward the east. The waters in the Mediterranean Sea would have spilled all over Palestine and the countries to the east if God had suddenly stopped the rotation of the Earth on Joshua's long day. In fact, the vast volume of water in the oceans, which now cover three-fourths of the Earth's surface to an average depth of over two miles, would have raced over all the continents and mountains as in the days of Noah. Therefore, since no earth-wide deluge is associated with Joshua's long day, it was not the result of any delayed rotation of the Earth; but was caused in some other way, namely, by a supernatural superior mirage of the Sun and Moon.

God had promised Noah and his descendants that "neither shall all flesh be cut off any more by the waters of a flood; neither shall there be any more a flood to destroy the earth."--Genesis 9:11 (compare with Job 38:8, 11). Therefore it was important that He remember and keep this promise, if He was to prove himself to be "the Faithful and True Witness" (Revelation 3:14). It was important that the Earth's orderly rotation on its axis be allowed to continue without interruption, so that the waters in the oceans would not again race over the continents. In the time of Isaiah that important promise to Noah was repeated in the following words: "I have sworn that the waters of Noah shall no more go over the Earth."--Isaiah 54:9 (See also Psalm 104:9). God proved himself faithful to his promises: He did not forget: and that is why God used a supernatural superior mirage of the Sun and Moon to produce Joshua's long day, instead of stopping the rotation of the Earth on its axis--which He could have done, had He chosen to do so small a deed in the vast astronomical heavens.

Hezekiah's Sundial

Speaking of Isaiah reminds me of another interesting supernatural mirage that occurred in his time, when Hezekiah was king of Judah. The story is recorded in two places in the Bible, in 2 Kings 20 and Isaiah 38. It tells us that God "brought the shadow ten degrees backward, by which it had gone down in the dial of Ahaz."--2 Kings 20:11. In the book of Isaiah it is recorded in these words, "So the Sun returned ten degrees, by which degrees it was gone down."--Isaiah 38:8. This supernatural mirage occurred in the afternoon also; but instead of making the Sun appear to stand still, it caused it to appear to move backward, or upward, some distance. The ten degrees of the sundial of Ahaz, used by Hezekiah, may represent eighty minutes, or one and one-third hours.[25] A supernatural superior mirage of the Sun could easily have produced the backward movement of the sundial shadow ten degrees. If a lateral mirage will apparently move a mountain some 90°, certainly a supernatural mirage could apparently move the Sun 10° or more.

The reader may be interested in a discussion of these subjects which began recently (September, 1951) in the Journal of the American Scientific Affiliation, Vol. 3, No. 3, with two articles entitled "Joshua's Long Day" by E. Walter Maunder, F.R.A.S., late Superintendent of the Solar Department of the Royal Observatory in Greenwich, England; and "The Shadow Returning on the Dial of Ahaz," by Annie S. D. Maunder, F.R.A.S. A discussion follows each article. These are reprints from the Journal of Transactions of the Victoria Institute in London, England. Copies of the Journal of the A. S. A. may be had at $1.00 each by writing to the secretary, Dr. H. Harold Hartzler, 107 W. Plymouth Avenue, Goshen, Indiana. The discussion will be continued in this Journal.

Every Eye Shall See Him Coming

Did you know that there is to be another and even greater supernatural mirage? Bible prophecy contains some statements which seem to indicate that another supernatural mirage will be observed at the time of the second coming of Jesus. It is revealed in the prophecies of the Bible that "every eye shall se him" coming in the clouds of heaven with power and great glory.[26] Prophecy also declared that he will come quickly, or swiftly (Rev. 22:20). If the people living on the back side of the Earth had to wait for the Earth to turn around so they could see Him coming, they would miss seeing this great event and would see Him only after He had arrived. Therefore, it seems more in keeping with all the related evidences to conclude that there will be another supernatural mirage formed in the atmosphere of our planet at the time of Jesus' second coming, which will permit people on the back side of the Earth to see simultaneously with all the others the actual coming of Jesus.

The additional heat, or at least much of it, which will assist in the making of this final supernatural mirage will come from the Sun directly during the fourth of the seven last plagues (which may be regarded as very literal), when power will be given to the Sun to scorch men with great heat (Revelation 16:8-9). This will have its effect upon the layers of the Earth's atmosphere everywhere, and will also cause much greater evaporation of water from the land, the lakes, and the oceans. This effect on the land is included in many of the prophecies.[27] By the time that Jesus comes with power and "great glory," the atmosphere of the entire Earth will have been modified in several ways and to such an extent that another supernatural superior mirage (the greatest of them all), will occur--such to the advantage of the righteous.

A long time ago it was written, "Light is sown for the righteous, and gladness for the upright in heart."--Psalm 97:11. Yes, even if the light is only a mirage there is a lesson to be learned from it.

Reader, Please Take Note: If you know of any more interesting mirage stories that are authentic, and if you have any reasonably priced pictures of mirages, please send them to the author, J. Lowell Butler, Route 2, Box 220, Gresham, Oregon. For photographs of mirages to have greater scientific value they should be accompanied with some additional written information such as the following (or as much of it as possible):

1. Three pictures should be taken for comparison, one with and one without the mirage; and one should be taken through a telescopic lens.
2. Kind of camera and film used, with exposure information, should be listed.
3. Distance to the mirage from the camera.
4. Location of the mirage, and the direction of the view (looking east or west).
5. Date and time of day; duration.
6. Position of the Sun in the sky (degrees above a level horizon, etc.)
7. Angle between a level horizon to bottom and to top of mirage.
8. Weather conditions (clear, hazy, part cloudy; air quiet; after a storm; relative humidity when photographed; barometric pressure; etc.)
9. Temperature where photographed and in midst of the mirage, for each foot of elevation from ground level to well above the mirage; kind of thermometer used.
10. Some word descriptions of the mirage.
11. Names and addresses of the photographer and other observers.

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26. Revelation 1:7; Matthew 13:39-43; 16:27; 24:29-31; 25:31; 26:64; Mark 13:24-27; Luke 9:26; 21:25-27; Acts 26:13-15; Hebrews 1:1-3; 2 Thessalonians 2:8.

27. Joel 1:10-20; 2:1,2; Isaiah 24; Nahum 1:4-6; Isaiah 33:9-17.

28. Other references given in the Text: (Part 2)
Page 15-17, Ps. 114;
Page 16,17, Ex. 6:1ø8; 7:1 to 12:42; 14; 17:1ø7; Num. 33:14; 20:1-12;
Josh. 3:1 to 5:1; 6:1-27; 10:1-14;
Page 18, Joshua 10:12-14;
Page 20, Joshua 10:1-14;
Page 21, Genesis 9:11 (Job 38:8,11); Rev. 3:14; Isa. 54:9 (Ps. 104:9);
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D I S C U S S I O N

(Of article by E. Walter Maunder on "Joshua's Long Day," in Journal of the American Scientific Affiliation, Vol. 3, No. 3, Sept. 1951, pp. 1-20)

MR. J. LOWELL BUTLER wrote: Mr. Maunder's paper on "Joshua's Long Day" contains considerable analysis of the circumstances surrounding that day and some analysis of the events of that day. In this he has contributed something toward a fuller understanding of this Bible story.

After my attention was called to some of the evidences in the story which show that the events of that day do not stop with verse 14 (of Joshua 10), that verse 15 belongs with verse 43, and that the events of the day are described all the way to and including verse 28 (compare 10:10 with 16-28), I sensed the need for a brief outline of all those events arranged in chronological order, and so went to work on that problem. Mr. Maunder's Cloud Theory put the hailstorm of that day after Joshua's command to the Sun and Moon to "stand still" (or "be silent"). Mr. Sidney Collett objected to this order of events, which was not the order given in the story. To me, Mr. Maunder's reply (p. 18) to Mr. Collett only beclouded the issue instead of clearing it up. This called for more study on that particular point: and it was an important point, for, if Mr. Maunder's order of those miraculous events was wrong, then his whole theory was wrong.

Mr. Maunder had observed that frequently the Hebrew writers had a "preference for a logical, rather than a chronological, order" of events. (p. 18) Yes, this is characteristic of the story of Joshua's Long Day as recorded in the tenth chapter of Joshua. Some events are in chronological order, while others are grouped together in a logical order. Verses 1-10 all seem to be in chronological order; which include some of the events that led up to the beginning of Joshua's Long Day. But verse 11 backs up in the narrative to fill in more details of how "the Lord discomfited the enemy" during that day. The first thing was the miracle of a timely hailstorm on the enemy that headed them off near Bethhoron and pursued them southward to Azekah, about 16 miles southwest of Jerusalem, and killed more of them than did Joshua's army. Grouped logically with the telling of this story of a miracle, is the story of the next miracle that occurred on that day, namely, the lengthening of the daylight hours so that the enemy could be pursued and destroyed before they could "enter into their cities." (v. 19) That is why the standing still of the Sun and Moon is told in verses 11-14, instead of between verses 19 and 20, where it belongs chronologically.

After Joshua's army reached the city of Makkedah, probably five miles south of Azekah where the hailstorm had ended, they took that city also and made it their temporary camp. But this chronological information is scattered into verse 28 and verses 20 and 21. Verses 22-26 tell of the hanging of the five enemy kings; and verse 27 tells of their burial in a cave when on that long day the Sun finally went down. This is the chronological end of that day; but the next verse gives a summary of what was done during those extra hours of daylight before the Sun set. Plainly the events of Joshua's Long Day are not written in the Bible in exact chronological order. But even so, I see no justification for Maunder's reversed order of the miraculous events. Instead, it seems more evident that the great hailstorm occurred before Joshua commanded the Sun and Moon to stand still. The hailstorm and its clouds were not what Joshua asked for. If they were, there would have been only one miracle that day instead of two. The cooling off effect of the hailstorm was welcome; but in addition to that help and the killing of many of the enemy by hail, more time was still needed to complete the destruction of the enemies' armed might that still remained. If there is such a thing as a logical chronology, that it is, just as

recorded, even though the second miracle should be described between verses 19 and 20. I submit the following brief outline of the day's events for your thoughtful study.

Chronological Order of Events on Joshua's Long Day

1. All night march of Joshua's army up grade to an elevation of 3,400 feet, from Gilgal to Gibeon, about 15 miles. (Joshua 10:7-9)

2. A great battle around Gibeon; enemy finally put to route. (10:10)

3. Enemy chased toward Bethhoron, about 9 miles or less to the west and north. (10:10)

4. Great hailstorm on enemy near Bethhoron. (10:11)

5. Hailstorm moved south, following the enemy to Azekah, about 16 miles southwest of Jerusalem. (10:11)

6. Some of Joshua's men followed the storm and learned that "they were more which died with hailstones than they whom the children of Israel slew with the sword." (10:11)

7. The enemy continued fleeing southward, and the five kings hid in a cave near Makkedah. (10:10 with v. 16)

8. Scouts of Joshua's army brought him word of the whereabouts of the five kings. (10:17)

9. Joshua gave orders for the cave's entrance to be closed with stones and guarded. (10:18)

10. Joshua gave orders to his army saying, "Stay ye not, but pursue after your enemies, and smite the hindermost of them; suffer them not to enter into their cities: for the Lord your God hath delivered them into your hand." (10:19 with v. 8)

11. Joshua realized that there was need for more daylight time in which to carry out his orders and complete the victory of that day: and on the strength of God's promise for that day (v. 8) and the timely miracle of the great hailstorm as definite proof that God was with him and his army, he believed God would grant what was now needed, namely, more hours of daylight until they could avenge themselves upon their enemies. "Then spake Joshua to the Lord. . .in the sight of Israel, 'Sun, stand thou still upon Gibeon; and thou, Moon, in the valley of Ajalon.'" (10:12)

12. "And the Sun stood still, and the Moon stayed, <u>until the people had themselves upon their enemies</u>. Is not this written in the book of Jasher? So the Sun stood still in the midst of heaven, and hasted not to go down about a whole day.' And there was no day like that before it or after it, that the Lord hearkened unto the voice of a man: for the Lord fought for Israel." (10:13,14)

13. Then Joshua followed his army from Gibeon to Makkedah, a distance of about 20 miles, and they slew the enemy "with a very great slaughter." (10:20 and v. 10)

14. Those that remained of the enemy "entered into fenced cities" (10:20) and they were not destroyed until the next day or a few days later. (10:29-42)

15. "And that day Joshua took Makkedah. . ." (10:28)

16. Joshua then made Makkedah his headquarters and "all the people returned to the camp to Joshua at Makkedah in peace: none moved his tongue against any of the children of Israel." (10:21)

17. "Then said Joshua, Open the mouth of the cave, and bring out those five kings unto me out of the cave. And they did so. . .And afterward Joshua smote them, and slew them, and hanged them on five trees: and they were hanging upon the trees until the evening." (10:22-26)

18. "And it came to pass at the time of the going down of the Sun, that Joshua commanded, and they took them down off the trees, and cast them into the cave wherein they had been hid, and laid great stones in the cave's mouth, which remain until this very day." (10:27) Thus ended Joshua's Long Day. (10:10 with 16-28)

"Harmony" of Joshua 10:1-43. (Proper order for reading) Joshua 10:1-6, 8, 7, 9-11, 16-19, 12-14, 20, 28, 21-27, 29-43, 15.

The last expression in verse 27, "which remain until this very day," shows that the story which we have in the Bible was written a long time after the events happened. And verse 13, which mentions "the book of Jasher," shows that the editor of our present record (probably Ezra) was putting together more than one record of Joshua's long day. In our more scientific age we would probably have given more thought to the exact order of the events of that day in narrating them; but not necessarily. We often divide a story into parts, and carry each part through to a finish before describing another part of the story. Even books of history do this. Therefore we should be able to understand the chronology of all of the events of Joshua's long day, even though the chronology jumps ahead in some of the verses.

What follows in chapter 10, verses 29 to 43, tells of the continued follow-up pursuit of the enemy in the central part of Palestine during the days that followed; and <u>then</u> the return to the main camp of Israel at Gilgal, near the north end of the Dead Sea. The repeating of verse 43 as verse 15 is an outright editorial mistake or later insertion.

On page 8 Mr. Maunder selects two extreme positions of the Sun and Moon--either the newest moon or the full moon--to build up a case for his theory. But we know full well that only a few days after the Moon has been in the new position, it can be seen in the afternoon sky while the Sun is still above the horizon. That is the way it was on Joshua's long day.

The expression in verse 13, "in the midst of heaven," does not necessarily mean in the middle of the daytime, or at noon, as Maunder contends. Rather it may mean something like "surrounded by." In other words, the Sun had not yet touched the southwest horizon, but was still surrounded by sky on all sides. Compare the use of this expression, "in the midst," as used in the following references: Ex. 8:22; Deut. 23:14; Ps. 74:12; 138:7; Prov. 8:20; Jer. 14:9; Ezek. 26:4,5; Matt. 10:16; 18:20; etc.

Therefore, the statement, "So the Sun stood still in the midst of heaven, and hasted not to go down about a whole day," simply means that its movement toward the sunset horizon ceased for some time before it reached the horizon. In fact, the whole narrative seems to imply that the day was nearly gone when much important work

remained to be done: and the record of what was done while the Sun and Moon stood still in the midst of heaven shows that several hours of time must have passed before the Sun and Moon again began moving toward the evening horizon. Judging from all the work that was done on that day, it was a longer day than an ordinary summer day.

The expression "about a whole day" is only an estimate, based upon the large amount of conquest that was accomplished that day, and influenced by the weariness of the fighting men who had not slept the night before and who had marched a total of about 40 miles in addition to taking part in at least two severe battles. The sundials did not record the passing time while the Sun remained still. A few extra hours under those circumstances would seem almost like a whole day, indeed!

It was of interest to me to learn that some other people had thought of explanations of Joshua's Long Day and the backward motion of the sundial shadow in the time of Hezekiah which were somewhat similar to my own. The Refraction Theory of H. A. Harper, the Sun-Mirage Theory of H. H. Turner, and the Bent Light Suggestion of Miss Ethel D. James, seem almost like introductions to my Supernatural Superior Mirage Theory. Colonel Hope Biddulph said thoughtfully, "The case of the shadow returning ten degrees on the dial of Ahaz seems, on the face of it, to be akin to that of Joshua's Long Day." (p. 26) This kinship becomes more evident when we apply what we now know about mirages to these Bible stories.

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BIBLICAL CHRONOLOGY AND GENESIS 1:1-3*

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As scientists, we tend to look at words as though they had "technical" point meanings only. We say, "This word means this, and that word means that." Frequently we fail to realize that each word has a more or less easily definable area of meaning. Few, if any, represent a point of meaning. Even "X" has ten definitions which cover half a column of space in Webster! Many words had a well-established usage before our particular science developed to the point it has today. Many words had, and have, an established usage from which the current usage has departed by change or modification. Some of us, and many in the rank and file of Christians, as judged by writings and conversation, it would seem, fail to recognize this simple principle of semantics. A failure to recognize the fact that words are not points of meaning, but areas of meaning, leads to misunderstanding and error. For example, the word "evolution" has a well-established general usage. We can refer to some aspect of it which happens to be true as "evolution," or we can use some narrow technical definition of it with which we can agree, and say, "I am therefore an evolutionist"--which is not the case at all, of course, except as we use the word in that very limited sense, ignoring all the other well-established parts of the meaning. We then actually speak erroneously, and others are misled.

The same is true in other fields, for example, sociology, economics, philosophy, where well-established words are redefined, and we who know the newer technical usages fail to recognize the validity of the other usages, and so cause unnecessary confusion in popular thought.

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This also is true in the Bible world. "Arbitrary" definitions are given to certain Biblical words and then the rank and file come to erroneous views upon what the Bible says about "creation," "begetting," "sonship."

Words are defined contextually. We may be able to trace the derivation, but there may be no relationship between that and the current usage. The definition of a word is made from the sum total of its several usages in actual contexts, whether written or spoken. The meaning of a word in a given environment or situation is determined by that environment or situation. Specifically, in the problem immediately before us we must do two things:

1. Negatively--we must not read English meanings and usages back into the Hebrew words, and

2. Positively--we must set meanings for the words we study which are consistent with the area of meaning that they cover in the Hebrew contexts.

I--The Word "Begat"

1. In English the word means that two successive generations are spoken of. "X begat Y" means that Y was born into the house of X by his wife Z.

2. In Hebrew usage "begat" carries that meaning, but it carries more as well.

> Matthew 1:8 says, "Joram begat Ozias." If we compare I Chronicles 3:10-12, we can see that Ahaziah, Joash, and Amaziah are omitted, yet the passage can and does say "begat."

This word, in Hebrew, includes in its area of meaning the idea "ancestor of."

II--The Word "Son Of"

1. In I Chronicles 9:12, Jeroham is called "the son of Pashur." Comparing Nehemiah 11:12, we find that there are three names between Jeroham and Pashur. "Son of," therefore, means "descendant of."

2. In Ezra 7:3, Azariah is said to be the son of Meraioth. If we compare I Chronicles 6:6-9 we find six names between Meraioth and Azariah (a very interesting homoioteleuton and so a textual error, a plain mistake, or as is proposed here, a shortening).

This last case is doubly interesting because Chronicles uses the word "begat," while Ezra says "son of."

Now let us apply these more correct, even if less "exact," meanings. First, however, one further illustration is necessary.

III--The Illustration of Terah

Genesis 11:26 says, "Terah lived seventy years, and begat Abram, Nahor, and Haran." Was Abram born, as would seem to be indicated here, when Terah was seventy years old? Compare 11:32--"And the days of Terah were two hundred and five years: and Terah died in Haran;" Acts 7:4, where we are told that Abraham left Haran after his father died, and Genesis 12:4, which says, "Abram was seventy and five years old when he departed out of Haran." It is thus seen that Terah was 205-75, or 130 years old when Abraham was born. This illustrates the Biblical usage in the dates in the chronologies.

IV--Genesis V

(I do not say we must take it this way, I simply say it does not do injustice to the meaning of the Hebrew usage of the words if we do take it this way. I say also that only an arbitrary assignment of a meaning to the words (point, not area), makes it impossible so to take it.)

Cainan, who is mentioned in Genesis 5, lived seventy years and at that point became the ancestor of (begat) Mahalaleel, and he lived 840 years after that point. Cainan lived 910 years and died. How old was Cainan (on the analogy of the Abraham and Terah illustration) when Mahalaleel was born? Was Cainan even alive when this particular descendant, sufficiently important to be included in the list, was born? One thing is quite certain--we cannot establish a chronology by adding these numbers. Another is equally uncertain, namely, how long it was from Abraham to Noah. It could have been a few thousand years, or many.

This much also is certain--God gave us a list of the important men of that period in order, with doubtless many omissions, and He gave us also the fact that all died eventually, even though they did have long lives. The effects of sin eventually caught up with them--death came.

V--Genesis 1:1-3

To few Biblical words has so much injustice been done as to the word "create." We believe in an ex nihilo creation, on the basis of John 1:1,3. Many "define" bara' to mean "make out of nothing," and so read the known ex nihilo creation back into Genesis 1:1, where it quite possibly is not intended at all.

The word needs to have its definition rephrased for popular consumption. Compare the use of this word in the following cases: Jeremiah 31:22, "The Lord hath created a new thing in the earth, A woman shall compass a man"; Psalm 51:10, "Create in me a clean heart, O God"; Isaiah 41:19, 20, "I will plant in the wilderness the cedar. . .I will set in the desert the fir. . .the Holy One of Israel hath created it (the new situation)"; Isaiah 43:1, "But now thus saith the Lord that created thee, O Jacob, and he that formed thee, O Israel (a new relationship)"; and Numbers 16:30, "And if the Dord make (create) a new thing, and the earth open her mouth, and swallow them up. . .(Dathan and Abiram)." Obviously a making of something material out of nothing is impossible in these contexts. What is made, created, is a situation that did not formerly exist. Might it be so in the case of Genesis 1? I think so.

Moses was not interested, particularly, in the original act of creation as was John. He was interested in telling us in broad outline how the earth got to be as it is now. Thus he says, "In the beginning when God was creating (not ex nihilo of the matter, but something new--the present form and order which did not formerly exist) the heavens and the earth, the circumstances were as follows: (1) the earth was without form and void, (2) darkness was over the face of it, and (3) the Spirit of God was moving over it. In such a case and time God said (verse 3 with its first was conversive, and hence its first step forward in the developing of the story), 'Let there be light,' and there was light."

If this interpretation can be justified on the basis of philology and syntax, then the so-called, popular, "gap" between verses 1 and 2 turns out to be a matter of philosophy and not a fact of revelation.

The facts are as follows:

1. The first waw conversive comes at verse 3.

2. The three preceding clauses are circumstantial ones. Compare Gesenius, paragraphs 156 and 141e.

3. The first word of the Bible is a noun in the construct state, and it is followed by a finite verb. This idiom is well attested in Semitic as a temporal clause. Compare Koran, Sura 37:144, where it is said of Jonah that he "tarried in his (the whale's) belly until the day when they were raised," and compare most especially Moses' own dialect and usage at Deuteronomy 4:15, "on the day that the Lord spake unto you in Horeb. . ."

In Conclusion:

The Genesis account does not set temporal limits in its lists of names before Noah; nor does it know, in and of itself, anything of a creation, destruction, and recreation; nor does it (while in no sense denying one) have anything to say specifically about the ex nihilo or original act of creation.

The Chairman, Dr. I. COWPERTHWAITE, asked for discussion of Dr. Young's paper.

Mr. WILLIAM J. SCHEPP: I am sorry that it wasn't quoted Isaiah 45-7 where bara is translated "create" and Ezekiel 23-47 where it is quoted "dispatch." I realize that Isaiah 45-7 is a very controversial passage of scripture. The Universalists have used it--the Jewish people have used it with the idea that God created evil and whereas if you take the word "create" out of Isaiah 45-7 and translate it on that basis, "I form the light and dispatch darkness. . .I make peace and dispatch evil. . .

To use the translation of bara in that particular sense overcomes the idea that we must water down the word "evil" there to make it affliction or sorrow.

Mr. ROY ALLEN: I was just thinking of one verse where bara is used that is, I believe, very significant as emphasizing the points of Dr. Young. I think it's the 102nd Psalm where David says, "And the people which shall be created shall praise the Lord."

He is a new creation. Old things are passed away and all things become new. We get a beautiful picture of just the people of whom David is speaking when he prophesied that the time will come when there shall be a people created that will praise His name, and were a new generation, a rival priesthood. Because we're not created as the speaker said, out of nothing, but God takes the old nature and makes something that didn't ever exist before, to a new birth. I praise the Lord for that verse, too.

Mr. DOUGLAS BLACK asked for clarification of the speaker's conclusion on Genesis 5 regarding men living before someone came to be and then living afterward.

Mr. G. DOUGLAS YOUNG: I'd like to preface, because it's going into the record, that I did not say that that must be the interpretation of Genesis 5, but on the basis of the Terah-Abram illustration, it conceivably could be that Cainan lived 70 years and then had his first child. The important person in that genealogy or in that group was Mahalaleel who may have been born 60, 70, a thousand, two thousand years later as far as we know. There's no way that we can set the time limit. In the case of Abraham and Terah it happened to be 60 years. That's 60 silent years,

and therefore in these other cases, it might be 60 or 70; it might even be longer. There's no way that we can say on it. But the thing that is significant in Genesis, the 5th chapter, is that Cainan was an important man in the sight of God. For some reason he was listed there, the same as certain ones were singled out for listing in the 11th chapter of Hebrews. Here is the immediate successor. The next one significant in his line is Mahalaleel and the terrifically vital factor that no matter how long anyone may live, they all eventually die so that the problem that used to block my thinking was that after he begat so and so, he lived so many years and he died. On the basis of the Abraham-Terah illustration, it's perfectly possible that that verse means--he lived 70 years, he began his begetting. Mahalaleel was the important man that followed him. This particular man, after he began his begetting, lived 810 years and he died. He lived 910 years all told, but he died.

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RECENT CONCEPTS OF THE ORIGIN AND EVOLUTION OF THE EARTH*

Heinrich D. Holland

Mr. Chairman, members of the American Scientific Affiliation, and guests. As Dr. Eckert has announced, this paper is concerned with recent concepts of the origin and evolution of the earth. To do justice to this topic would require a number of one-hour lectures. It will therefore be my aim to present a summary of results together with but a minimum of methedology. The method will be as follows: I will first present some facts concerning the earth, and then deductions from such data based on assumptions which appear reasonable today. I would like to consider under this heading evidence as to the chemical constitution and the physical condition, especially the rigidity and temperature, of the Earth. The same approach will then be used for the solar system as a whole, and an attempt will be made to point to the more probable origin and mode of development of the solar system.

The first slide presents some of the data basic to a study of the origin, development, and present status of the earth. The mass of the earth has been deduced from experiments with the torsion balance: the radius of the planet is determined from geodetic data, and calculations using these two figures yields the mean density.

The oblateness or ellipticity of the earth is defined by the equation

$$f = \frac{a - b}{a}$$

where a and b are respectively the equatorial and the polar semidiameters of the earth. The semidiameters can be determined by geodetic measurement of distances on the earth's surface or by measuring the difference in the gravitational force of attraction at the equator and at the poles.[1]

The moment of inertia, I, of a rotating body is defined by the expression

$$E = I w^2/2$$

where E is the kinetic energy and w the angular velocity. It can be shown that for a sphere of uniform density the inertia is $2/5\ Mr^2$ where M is the mass of the sphere and r its radius. It follows that I/Mr^2 for such a body is 0.4. The moments of inertia of the earth can be calculated with a knowledge of the precessional constant and the ratio of the centrifugal force to the gravity at the equator.[2] 0.334, the value thus obtained, indicates that the earth cannot be a sphere of uniform density throughout.

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The viscosity of a substance is the friction which opposes plastic deformation. From the deformation produced by the moon on the earth's surface the viscosity of the earth is estimated to be about 10^{18} to 10^{20} poises. This is to be compared with a viscosity of 0.02 poises for water and of about 10^{16} poises for lead at 20°C.

Turning now from the physics of the earth to the chemistry of the igneous rocks available for inspection at the surface,[4] we note that over 98% of the weight and almost 100% of the volume of these rocks is contributed by 8 elements, all of low atomic weight. It follows that the only common compounds are the oxides and silicates of the metals listed, and that, from the volumetric point of view, the crust can be considered as consisting largely of oxygen ions and interstitial metallic ions.

From geologic studies to date we know that the continental masses are primarily blocks of alumine-silicates of potassium, sodium, and calcium floating on a substratum consisting predominantly of magnesium and iron silicates. In the ocean basin continental material seems to be essentially absent.

This conclusion is supported both by samples dredged from the ocean floor[5] and by evidence from the study of the velocity of seismic waves within the earth.[6] It is the data from this branch of geophysics which gives us the best insight into the internal structure of the earth. Consider the earth as shown in the next slide, and specifically consider an earthquake occurring at the indicated spot. Both compressional and shear waves will usually be generated by the shock, and these will radiate out in all directions from the focus of the quake. The time of arrival of the waves at the surface can be recorded by seismographs. Clearly, if the earth were completely uniform, the arrival times would be equal at equal distances from the focus of the quake, and there would be a uniform change in the intensity of the compressional and shear waves with distance from the focus. That this is not the case was recognized early in the history of seismology. Specifically it was found that at angular distances of 102° to 143° from the focus the amplitude of the compressional waves is very small. This can be very satisfactorily explained by assuming the presence of an earth core extending from a depth of 2900 km to the center of the planet. In this core the velocity of the compressional waves would be smaller than at the base of the overlying stratum, so that the core would act as a convergent lens. Such a view is confirmed by the disappearance of transmitted shear waves at the same depth as the boundary of the core. This disappearance, indicative of a very much smaller shear strength in the core than in the mantle, is strong evidence for the liquid nature of the core.

A second discontinuity at a depth of about 30 km was discovered in 1909 by Mohorovicic, and was assigned to the base of the continental blocks mentioned above. Further breaks have been observed at a depth of 400 km and within the core at a distance of about 1300 km from the center of the earth.

As mentioned before, the geologic evidence points strongly to a magnesium-iron silicate layer, presumably of the mineral olivine, below the continental crust. The velocity of propagation of seismic waves through this portion of the earth checks well with that to be expected for material of this composition. The problem now remains to assign definite compositions to the various layers within the earth. Bullen, on the assumption that the compressibility of subcrustal material is adiabatic, has calculated the probable pressure and density variations down to the earth's center, using the observed arrival times of seismic waves, the moment of inertia of the earth as a whole and the average density shown in the first slide. As shown in the next slide the pressure varies rather steadily, showing only a small inflection at the core boundary, and flattening near the center due to the decrease of the gravitational acceleration. According to this interpretation the pressure at the center of the earth is about 3.64×10^{12} dynes/ cm^2 or about 3 1/2 million atmospheres.

The calculated density variations are more complex. There is a general rise from the surface to the boundary of the core, with irregularities at 30 km and at 400 km, and a considerable curvature between 400 and 1200 km. At the core boundary there is a large density increase followed by a continual rise until a distance some 1300 km from the center of the earth is reached. There appears to be further rapid increase at this point. However, the present evidence for the value 17.2 g/cc proposed by Bullen for the inner core is not too strong.

Such a density distribution is in good accord with traditional earth models based on the study of meteorites. The variations between the depths of 30 km and 2900 km can be explained in terms of changes in the density of olivine due to increasing pressure, although there may well be some compositional changes which escape definition by the proposed density curve. The estimated values for the density of the outer core check well with calculated values for the density of iron at pressures above 10^{12} dynes/cm^2 [7] whereas the composition of the inner core is still somewhat problematical.

Within the last ten years two rival interpretations of earth structure have been proposed. Kuhn and Rittmann[8 9] arguing from the genetic difficulties of accounting for the proposed distribution of silicates and metallics within the earth, suggest that our planet consists of a thin crust of silicates and metallic iron underlain by more or less unaltered solar material. This removes the necessity of separating a large amount of silicate material from the native iron, but fails to account quantitatively for the density distribution within the earth and for the very rapid changes in the physical constants at a depth of 2900 km.[10]

A second interpretation due to Ramsey[11] is to the effect that the changes at the boundary of the core are not chemical but purely physical. It is probable that hydrogen collapses into a metallic state at a pressure of 0.7×10^{12} dynes. Above this pressure electrons no longer "belong" to specific nuclei but form an electron gas similar to that postulated to account for the properties of true metals. During this transition the density of the gas increases from about 0.35 g/cc to about 0.7 g/cc. Reasoning by analogy Ramsey suggests that a collapse of the structure of olivine to a metallic state might account for the observed density jump at the core boundary. A logical extension would be to suggest a further collapse involving the loss of identity of electrons in the inner shells of magnesium, iron, silicon, and oxygen to account for the density changes at the boundary of the inner core. That such collapsed states exist is most probable since it has been observed that the radius of white dwarf stars decreases with increasing mass, but whether the pressure in the earth's interior is sufficient to produce collapse in the case of olivine has not been demonstrated. Furthermore, recent work suggests that the density to be expected of such collapsed material would probably be less than the observed value at the core boundary[7] as deduced from seismologic evidence. It is therefore to be concluded that the Bullen earth model is probably essentially correct.

The present and past temperatures of the earth at the surface and at depth have been a topic of great interest ever since Lord Kelvin's celebrated work on the subject. Yet even today, after considerable refinement of the earlier data, it is difficult to make definitive temperature estimates for the first few hundred kilometers of crust and mantle, and it is almost impossible to assign values which are better than educated guesses for temperatures near and within the core. The main difficulties rest in the absence of data on the initial temperature distribution within the earth and in the uncertainty of the mode of heat transfer within the earth's mantle. These difficulties have been emphasized by Slichter[12] and Urry[13] in their recent treatments of the subject. At present the major part of the heat transfer from the

interior of the earth is derived from the energy liberated by the decay of radioactive atoms. The distribution and decay schemes of uranium, thorium, and potassium within the earth's crust and at the top of the mantle are well enough known at present to enable us to place considerable faith in this statement. Provided that heat transfer through the mantle has occurred chiefly by conduction, it can be shown that the cooling of the earth at depths greater than 700 km has been negligible even during the past 3000 million years. Assuming further with Adams[14] that cooling by convection predominated before solidification and that an adiabatic temperature gradient existed at that time, the temperature at the boundary of the core can be calculated to be several thousand degrees centigrade. However, Schlichter[12] points out that slow convective cooling despite the rigidity of the mantle is not impossible and may well exceed the effect of cooling by conduction. The demonstration of convection cells within the mantle would also be of extreme interest geologically in connection with the causes of mountain building.

The following slide presents Urry's results on temperature variations within the crust during geologic history. It can be seen that, if these estimates are correct, temperatures near the melting point of crustal rocks pertained relatively near the surface during much of the history of the earth.

We can now use the earth model developed up to this point to shed some light on the origin of the earth. However, since the earth appears so closely related to the sun and to the other planets, it may be well to summarize some of the facts known about the other inhabitants of the solar system. The nine planets Mercury, Venus, the Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto describe about the sun paths which are almost circular and almost coplanar. They all rotate about the sun in the same direction and also in the same direction about their own axes. This statement is true of almost all of the satellites as well. The distance of the planets to the sun can be expressed fairly accurately by the Titius-Bode relation[1] which states that

$$D = (4 + 3x2^{n}) \times 147.6x10^{5} \text{ km}$$

where D is the distance of nearest approach of each planet to the sun and n is an integer. Thus for Mercury n = 0, for Venus n = 1, for the Earth n = 2 and so forth.

Any theory of the origin of the solar system must satisfactorily explain these facts and the hosts of others which have been collected through the intensive study of the system. Two theories have alternately been credited and discarded: the collision theory of Buffon and the dust-cloud theory of Kant and Laplace.

The Buffon theory modified by Chamberlin, Moulton, Jeans and Jeffreys[2] was widely accepted until the close of the 1930's. The principal concept was as follows: a star passed close to the sun at one point in the past. A large tide, raised on the sun by the gravitational attraction of the star, ultimately broke into an extended filament which later condensed into gaseous globules, the proto-planets. On the basis of this idea the concept of the coplanar orbits and the similar direction of rotation of the planets are easily explained. So also is the original heat to permit fractionation of the earth into its present compositional configuration. However, the almost circular nature of the orbits, the fact that some of the satellites do not revolve in the same sense as the majority, and the Titius-Bode law of planetary distances are not explained.

Recently the criticism of the collision theory has led to a further analysis of the discarded Kant-Laplace hypothesis. Under the treatment of Weizsaecker,[15] Kuiper,[16] ter Haar,[17] and others, the main objections seem to have been removed, and the theory is at the moment very popular. According to Weizsaecker[15] the planetary system

originated as a flat cloud of gas with a density in the neighborhood of 10^{-9} gm/cc. It can be shown that at the temperature of a few hundred degrees Kelvin to be expected under these conditions, condensation of the gas particles into larger chunks is inevitable. Presumably the cloud was relatively homogeneous and of approximately the composition of the sun. This would mean that the bulk of the material consisted of hydrogen and helium. As the chunks grew by capture, some probably were again destroyed by head-on collisions. Gradually, however, larger and larger bodies are supposed to have formed; these were soon able to capture neighboring particles by virtue of their large gravitational attraction. By carrying through rigorous arguments regarding this process, justification can be found for the Titius-Bode relation. Intuitively it can be seen that the original, roughly circular rotation of the gas cloud would be transferred to the planets, thus endowing them all with the same direction of rotation in nearly circular orbits. The non-conformist behavior of some satellites can be ascribed to non-homogeneous relations at the edge of the cloud and at a few points within. The main objection to the theory in its original form, that a gas cloud of sufficient size to produce planets would have a moment of inertia much greater than that of the planets as a group today, can be overcome by assuming the escape of hydrogen and helium such as seems indeed to have been the case in the vicinity of the inner planets.

Further support for the theory comes from a study by Brown[18] of the comparison of the abundance of slightly volatile elements in meteorites and in the sun's atmosphere. The relationship is shown in the next slide. It can be seen that there is fair correlation between the ratios of the elements in the sun and in the meteorites. This is to be expected if the gas cloud was of the same composition as the sun's atmosphere today and if meteorites are either uncaptured chunks or parts of fragmanted planets.

However, if the earth did grow in an initially cold condition, the present layered distribution of metallic iron and silicates is hard to explain. It may be possible to show that the gravitational energy released during accretion and energy from the disintegration of radioactive elements distributed more evenly throughout the earth than today were sufficient to cause melting and fractionation of the planet.

H. C. Urey[19] recently made the statement that "taken with the astronomical and physical data, the chemical facts are so detailed that it is possible to construct an acceptable picture of the earth's formation." I doubt that all investigators in these fields are as optimistic as Dr. Urey. Nevertheless, the impetus which the recent developments in astrophysics, geophysics, and geochemistry have given to the study of the structure and composition of the earth and the other planets, both past and present, may well enable us to discard some of the if's and but's which today decorate our statements on these subjects.

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SCIENCE AND SALVATION
(The Mystery of Iniquity)

By
Hawley O. Taylor

Is the plan of salvation scientific? To answer this question let us first consider a method of science appropriate to a situation which does not seem to yield to a frontal attack but rather must be attacked by an indirect maneuver. As an illustration let us take the question which scientists have asked about matter--its constitution; is it continuous or is it composed of unit particles? Having no microscopes powerful enough to reveal its structure, the scientists assumed a hypothetical structure--they assumed that matter is composed of innumerable tiny particles (molecules) in very rapid random motion. In their quest, a sequence of natural steps of reasoning led the scientists to the conclusion, among others, that the volume of a gas should diminish in proportion to the increase in pressure on the gas, the temperature remaining constant.

Now this is a conclusion which can be put to an experimental test in the laboratory. If such a test should uphold the conclusion reached through reasoning based on the original assumption, then this assumption would be regarded as plausible; and, if no other phenomena should cast doubt upon it, the assumption would then be regarded as true--an established fact in nature. In the case here cited as an illustration, the test in the laboratory corroborated the conclusion reached through logical reasoning, and matter is now regarded as made up of molecules.

Now let us apply this scientific method to the plan of salvation, starting with the assumption of a Great First Cause of all things that exist, from which Cause the present condition of "the heaven and the earth" would naturally follow. Since we are not restricted as to what we might assume, let us assign for the attributes of such a First Cause the following:

1. Infinite--embodying limitless power and resources
2. Personal--self-conscious, able to reason and to will
3. Eternal --continuous and consistent as to purpose and its supporting principle and
4. Supreme --never failing to accomplish

Also let us assume that, in the expression of the Great First Cause, there are these three aspects: the First Person or Source of all being, the Second Person or Administrator of all activity, and the Third Person or Interpretor. And, for an incentive to activity, let us assume self-manifestation, or the insistent urge to become known. For a name, let us call this assumed Great First Cause, having these attributes and properties, the Almighty. An Almighty so endowed must be good without a trace of evil, for infinite evil would be self-destructive.

We are now ready to trace some of the consequencies and outworkings of the Almighty having these assumed attributes. The following outline of the development leads to some wonderful vistas! Eager to become known, what would such an Almighty naturally do? A logical development would perhaps take the following course:

A. He would create beings (subjects) capable of knowing him, to whom he could manifest himself, and by whom he would be appreciated. In order to learn of him that they might appreciate him, these subjects must respect the Almighty and, to be genuine, this respect must be <u>voluntary</u>. Their activity and choice being thus voluntary, <u>disobedience</u> lurks as a possibility.

B. He would create a vast universe through which to manifest his power, the subjects being given responsibilities in this universe in order, little by little, to learn of the exceeding greatness of the Almighty--for learning of him is the employment of the realm, and to know him is its life. A highly gifted subject, Lumen, is given the planet Terra as his domain.

We now come to a sign post which points out several directions which may be taken in the further pursuit of our quest. The course chosen by us involves the following question: In a realm where harmony alone exists, is it possible that the Almighty might perhaps be cramped in the expression of some phase of his nature? In other words, can the richness of love (including compassion, longsuffering and faithfulness) be manifested where a helpless and hopeless recipient is absent?

C. Following this lead, the quest now turns our attention to the gifted Lumen, who is now struggling with some mighty thoughts that have arisen within him. Seeing in the Administrator or Second Person powers and capacities overshadowing his own, he is overwhelmed with envy. Convinced that force coupled with the threat of terror should be the guiding principle of administration where achievement is the goal, he prevails upon about one-third of his fellow subjects to take part in a rebellion against the methods of the Second Person. This faction then takes up its abode on the planet Terra, which now suffers strains and occasional convulsions under the new rule of force by the invisible visitors. The process of unfoldment is now established in the universe by the Almighty in his dealings with Lumen, and <u>time</u> begins in a <u>finite</u> realm.

D. The situation caused by Lumen and his followers in their rebellion offers the dark contrast required for the expression of the high quality of <u>love</u> inherent in the Almighty. In order that this expression may be universally accepted, the rebellious faction must be treated with absolute justice.

E. For the purpose of revealing to his subjects the meaning of love, and in order to give Lumen a fair chance to prove that force and terror are superior to love as a governing principle, the Almighty places servants, created as to their nature in his own image and likeness, as objects of his love on the planet Terra, Lumen's domain. The vision of these servants is limited by a seeming veil to the perception of finite things only, hence the activity of all the subjects, obedient and disobedient, is unseen by them.

F. In order that the manifestation of love may be adequate as a lesson to all his subjects, two aspects of it must be present--the love of the Almighty must be returned to him by wholehearted obedience on the part of the servants. Disobedience would result in existence outside of the Almighty's plan and purpose of creation--existence in outer darkness, dead to all that is good with its promise of progress. This death was chosen by Lumen and his followers in their pride of intellect, and they now seek to victimize the servants whom the Almighty has placed upon the planet Terra, Lumen's domain. Under their assault, these servants, dazzled by the promise of personal gain, yield to Lumen's craft, and rush blindly after his devices. The planet Terra is thus sunk in the depths of iniquity.

G. However, longsuffering and justice require that time be given for Lumen's methods to mature in failure. Therefore the reward of the deeds of Lumen and his deceived followers must be held in abeyance, and the day of vengeance delayed until the universe is satisfied that force and compulsion finally must fail in the administration of a program of being and achieving.

H. Thus the servants on the planet Terra have chosen Lumen and so have been overcome by death although to their fellow servants their physical being appears unchanged. Death is thus the natural penalty for disobedience. Now a penalty must in justice be paid either by the law-breaker or the law-maker.

I. In mercy for his deceived servants, the Almighty in the person of the Administrator, whose office aroused Lumen's envy, descends to the planet Terra, clothed as a servant, to reveal to the lost servants the character of the Almighty, particularly the power of love rather than force and compulsion as the basis of real achievement. The servants on the planet Terra with few exceptions reject the message, and the Second Person is put to death. The death of the Second Person satisfied the justice which demands that the penalty be paid by either the breaker or the maker of the law. Some of the lost servants, seeing to what depths love is impelled to go to succor the helpless, as contrasted with the selfish achievement offered by Lumen, repent and turn to the leadership of the Almighty as expressed in the Administrator--and the joy and peace of a new life thrill them, for by so doing they are born into the family of the Almighty, one in spirit with him.

J. The delayed execution of the penalty coming to Lumen and his followers for disobedience gives them a false sense of victory when the Second Person is rejected and slain on the planet Terra, for, having assumed the criminal's place, the Almighty turns from the Second Person. This loss of fellowship is the real death which was dreaded, toward which the Administrator had steadily advanced for the succor of the lost. The Almighty accepts the death of the Administrator as completely satisfying the claim of justice (for he gave his life for the life of the disobedient servants) and not only restores him into full fellowship with himself but gives him a name which is above every name. This restoration is manifest to the servants on the planet Terra by the resurrection of the body of the Administrator from the grave. Since the claim of justice is now satisfied, the Almighty pronounces sentence on Lumen and his followers.

The life and death of the Administrator revealed to Lumen's followers that the attraction of love must finally win over the compulsion of force, and Lumen now concedes that love has won the day as the guiding principle in government, and that lasting success in administration cannot follow when selfish motives are fostered. The Second Person, not having himself been disobedient and being one in essence with the Almighty, returns in triumph to the realm of Harmony there to plead the cause of those repentant servants who accepted his pardon against the vaunted claims of Lumen who still uses his wiles to blind their eyes.

K. So important to the servants on the planet Terra is the Almighty's love gift to them that the story is repeated to succeeding generations, the Third Person (invisible to the veiled vision of the servants) interpreting its significance. The story concludes with the remarkable offer of a glorious home with the Almighty for all who sense what life might be without him, and who therefore accept the death of the Second Person as satisfying the penalty due for their disobedience.

L. When the failure of Lumen's rebellion is acknowledged by all, the wrath of the Almighty breaks forth on the disobedient, and the Administrator comes to the planet Terra the second time to execute judgment. Lumen is now banished by universal consent from the realm of Harmony. The planet Terra is then reclaimed as an abode for the servants who proved faithful, and, in the realm of Harmony, the Almighty gives them the office left vacant by Lumen.

M. In the material or physical aspect of the universe, in which the planet Terra serves as the arena where the quality of love is revealed to his subjects, the Almighty has incorporated an analogy of love. This analogy, gravitation in the physical

universe, is a force of attraction between particles and masses just as love is a sympathetic attraction between personalities. There is also magnetic and electrical phenomena which exhibits both attraction and repulsion, attraction when charges have unlike polarities (a positive and a negative) and repulsion for like polarities: suggesting love and its opposite, hate, two aspects of one profound passion, for the Almighty hates that which would injure the object of his love. These phenomena on the physical plane give the servants an opportunity to participate in the lesson which the Almighty desires his subjects to master.

CONCLUSION. The natural outworking of the love-quality in the Great First Cause having the attributes assumed has been traced to logical conclusions. Now comes the crucial test--do the conclusions reached correspond to the facts resulting from the laboratory test, the experimental work in this case being in the great laboratory of human experience as revealed on the pages of history.

One rather startling conclusion that developed from the assumed premise by steps of logical reasoning is that evil should now dominate on the planet Terra. Does this correspond with the actual outworking of things on the planet Earth? It is obvious that the agreement in this case is perfect. The cause of some physical disturbances such as earthquakes, floods, etc. may be included.

Another conclusion that developed in the course of the reasoning is that the Administrator came to the planet Terra to represent the Almighty and reveal to the lost servants the meaning of love by himself suffering the penalty for their disobedience and offering them free pardon. But his message was rejected by the servants and he was slain. However, the Almighty received him back into the realm of Harmony. This conclusion also corresponds exactly with recorded history, for we read that Christ came to earth, went about doing good, healing the sick and doing many mighty works to show God's love for lost sinners, also claiming Himself to be equal with God. His message was rejected and He was crucified, but in three days arose from the tomb, and, after forty days of teaching His disciples, ascended to heaven.

A third conclusion in the development is that the story of the Administrator's life and death was repeated to succeeding generations, the Third Person interpreting its significance. This corresponds with the facts of history, for the church is a well-known institution in the world which has told the story of Christ's redeeming love for 1900 years, based upon the Scriptures inspired by the Holy Spirit.

Then there is the conclusion that those servants who accept the death of the Administrator as satisfying the penalty of their natural state of disobedience, will live eternally in glory with the Almighty. This corresponds with the great peace of mind and change in the motive controlling the lives of those who, throughout the age, have accepted Christ as their Savior.

The conclusion that the Administrator will again return to the planet Terra to take command and execute judgement upon all who reject him has not yet a counterpart in history; but, since the other conclusions have been so fully verified by the facts brought out in the great laboratory of human experience on earth, we may look forward with confidence for the outworking of the last conclusion in a return of Christ to earth, not in humiliation as before but as a judge executin wrath upon all who have refused His pardon for their sins.

Finally, since these laboratory observations are in exact agreement with the conclusions reached by logical reasoning from the original assumption, the inference follows that the premise is at least plausible; and, no exceptions having been found, shall the assumed First Cause be regarded as true?--No other view seems tenable!

Since the plan of salvation, as revealed in Scripture, is included in sections I, J, and K of this outworking, it too is established as scientific--until it can be shown that the spirit of love, compassion, longsuffering and faithfulness would naturally unfold in some other way than in the giving of himself unreservedly for the succor of someone in trouble who looks to him.

SEQUEL. Lumen's charge of injustice on the part of the Almighty is finally rejected as false by all the subjects in the realm of Harmony, including Lumen himself and his followers; and, no place being found for them, Lumen falls a discredited leader. His followers, torn with dissension and remorse, fall with him. Never again to see the face of the Almighty, these subjects, with the servants on the planet Terra who scorned redemption, now suffer their chosen lot, a living death with the deposed Lumen.

The subjects mentioned in the outline correspond to angels, and the servants to men on the earth (Terra). The purpose and intended destiny of man is illuminated by events which naturally unfold from the Great First Cause having the attributes enumerated--which are recognized as belonging to the God of the Bible. In the outline, you are enabled to view yourself against the background of the conflict raging about you in the unseen. It should not take you long to choose the master with whom you wish to live forever--it will be either the vindicated Almighty or the vindictive Lumen--God or Satan.

"Behold, now is the accepted time: behold, now is the day of salvation" II Cor 6:2

THE PLAN OF SALVATION. While it requires sixty-six books of the Bible to round out the plan of salvation in all phases of its applications to the needs of mankind, there are however found concise statements of it in a number of places, such as:

"...God was manifest in the flesh, justified in the Spirit, seen of angels, preached unto the Gentiles, believed on in the world, received up into glory" I Tim3:16

Also, "...Christ died for our sins according to the scriptures;...was buried, and ...rose again the third day according to the scriptures; and...was seen of Cephas, then of the twelve..." I Cor 15:3-5.

And finally, "For God so loved the world that he gave his only begotten Son, that whosoever believeth in him should not perish, but have everlasting life" John 3:16.

In section M mention is made of two aspects of one profound passion inherent in the Almighty, that is, love and hate. Statements of these contrasts are found throughout Scripture, such as:

"Thou hast loved righteousness and hated iniquity..." Heb. 1:9.

"The Spirit of the Lord God is upon me; because the Lord hath anointed me to preach good tidings unto the meek...to proclaim the acceptable year of the Lord, and the day of vengeance of our God..." Is. 61:1-2.

"O Lord...in wrath remember mercy" Hab. 3:2.

The condition of mankind showing why a plan of salvation was necessary is given in Romans 3:23: "all have sinned and come short of the glory of God."

The penalty is given in Isaiah 59:2: "your iniquities have separated between you and your God...that he will not hear you."

Also in Ezekiel 18:4: "the soul that sinneth, it shall die."

And the pardon is given in John 1:12: "as many as received him, to them gave he power to become the sons of God, even to them that believe on his name."

ACTH and REINS

by

Jos. S. Maxwell, M. D.

ACTH is about the most up to date medicine we have. The discoverers of it got the Nobel Prize for Medicine in 1950.

ACTH stands for the adreno-cortico-tropic-hormone. The word "reins" is old English for our word kidneys. The adrenal gland sits, like a cap, on top of the kidney.

In the King James version of our Bibles there is confusion of terms because where it uses the word "mind" the original Hebrew word is "heart." The old Hebrews seemed to know about the heart but not the mind. The Bible contains many connections between heart and kidneys ("reins") and both of these terms are used mainly as referring to the deeper emotions. Many times the word "trying" or testing is used,

Ps. 7:9 For the righteous God testeth and heart and the kidneys.

Ps. 16:7 I will bless Jehovah, Who hath given me counsel, yea my kidneys instructeth me in the night seasons.

The Old Testament saints were often instructed in the night seasons in and through dreams.

Now much of this sort of medicine is still unknown. Medicine still does not know what part the heart has in the interplay of the emotions. It is just commencing to realise that the adrenal at least and perhaps also some hormone secreted by the kidney itself has a great part in the emotional life of man. It is as if the Holy Spirit, Who, of course, knew all of medicine before it happened, assumed the medical side of the filtering part of the kidney and the pumping part of the heart, as being of little interest except to an M. D. and therefore stressed the part played by the kidney and the heart in the emotional life. Also that is a very important side of man.

This is of more interest in these days when we are just entering the emotional or psychic side of medicine. In my day in medical school the psychic side was little known and we studied the somatic (literally, the word means meat, body) side, but we did not know enough to study the psychic side. But now they combine that part of man calling it Psycho-Somatic Medicine, and it is considered to be very up to date indeed. Eventually, as it limpingly does, Science shall get around to the heights and perfection of the Bible which insists that the highest part of man is not Psycho and not Somatic but is Pneumo--or SPIRIT. Someday then we shall have Pneumo-Psycho-Somatic Medicine such as wise medical missionaries have been practicing for years. The Spirit, being the only lasting part of man, would seem to warrant a more careful study than it gets.

This present study concerning the part that the brain and kidneys and heart play in man's life relates to one of our new drugs which affects all parts of man. One of its most dramatic effects is the marked euphoria which the patient experiences in treatments.

Even in 1951 Medicine does not know what part the Spirit plays on the psyche and body. Medicine now says that the cortex of the brain receives impulses from the outside world and transmits them to the hypothalamus and this in turn influences the pituitary and this in turn, the hormone secreting glands of the body, including the adrenal. The pituitary is a mysterious unknown in the hormone system of glands of

internal secretion. It is hidden away in the depths of the brain, in just about as inaccessible a part of the body as could well be found. The anterior lobe of the pituitary secretes ACTH. This hormone acts on the cortex of the adrenal gland of the kidney to produce corticosteroids, one of which is cortisone. In all there are about 20-30 known hormones produced by the cortex of the adrenal gland. The medulla of the adrenal secretes "adrenalin" or suprarenin.

When a person gets a shock--like the sudden appearance of a lion in the way--adrenalin is poured out into the blood stream and it calls out the reserves of the body: extra strength of the muscles is called up, extra energy, faster reflexes, keener vision, hearing, and thinking, all are called into play quickly. Many a person has found a strengthh he did not know that he had when confronted with a real emergency in life, and even life itself has been saved because we have this valuable gland.

But for the ordinary stresses of life, the annoyances, the conflicts, the daily worries, the thing that "burns you up" (and it comes nearer to doing that than you think), the Lord gave us ACTH. This whole chain of reactions handles the usual worries of life without difficulty. But if these stresses increase or get stronger finally the ACTH breaks down and the kidneys break down in their reaction. The overworked kidneys cannot put out any more cortisone to combat the stresses and we get sick. In ordinary day by day existence about 40-60 units of cortisone are found in the blood. Venning (1) showed that in a woman directly after an outburst of hysteria these cortical hormones rose to 300 units in 24 hours. Another patient showed 250 units when she heard that her sister was dangerously ill. "These measurements suggest that a mental or emotional upset is just as truly an injury to the body as the fracture of a bone."

If the "Kidney" is totally exhausted of its cortisone by continued unusual stress then collagen disease aets in. This is what we have in arthritis, rheumatism, perhaps in high blood pressure, coronary heart disease and many other ills. Our emotions really make us sick. In Egypt, some of my patients grieved so over the death of an only son that they became blind.

Ps. 73:21 For my soul was grieved and I was pricked in my kidneys.

This is the picture of stabbing with a knife or the point of a spear, and this would stop all cortisone response, and all adrenaline secretion. This would mean death.

Prov. 23:16 Yea, my kidneys will rejoice when my son's lips speak right things. Any fine Christian father knows this precious experience. What a pure joy!

Prov. 17:22 A merry heart doeth good like medicine.

Jer. 11:20 But O Jehovah of Hosts, Who judgest righteously, Who testeth the kidneys and the heart.

This verse is quoted by John in Rev. 2:23 where the Greek word for kidneys is NEPHRON which is also used as a technical term in kidney work.

All of the Bible was written from two to three thousand years ago. It claims to be the WORD of GOD. The fact that as far down the years as 1951 A. D. there is still much in the Bible ahead of the best medical knowledge today and the fact that no discovery in medicine, of any date, effectually refutes the original Bible, in its literal language, is certainly a strong suggestion for thoughtful man that it is what it claims to be--GOD'S WORD. Only God could know in advance and know more than any scientist.

As a scientist, do you study it for basic science and for that part of man which lives forever--man's Spirit?

Do you speak right things to rejoice the heart of your heavenly FATHER?

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(1) Gray, G. W., Cortisone and ACTH, Scientific American 182:30 for March 1950 quoting Venning. This reference is quoted in the Archives of Ophthalmology Vol 44 No 2 for August 1950.

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