

side and have a bit of room left over.

The spots are huge tornadoes in the sun's atmosphere. Actually they are brighter and hotter than an electric arc, but appear dark by contrast with the hotter and brighter surrounding regions. (The vertical line is a plumb line photographed on the plate to help orient it.)

Science News Letter, February 20, 1937

ASTRONOMY

Great Solar Activity Taxes Code for Reports

SO NUMEROUS have sunspots become in the latest bursts of solar activity that the scientists' own radio code, by which far-flung observatories throughout the world communicate with one another, has become ineffectual.

The code of the International Scientific Radio Union, whose code name is URSI and whose messages are called ursigrams, has space for telling the number of sunspots up to 99. Seldom is this number exceeded in any day's observation. But in recent weeks, however, messages have been coming through marked 40 add 100 or 20 add 200, as examples, which mean 140 spots and 220 spots respectively. Peak number was on February 1, when 370 sunspots were observed.

Science News Letter, February 20, 1937

ASTRONOMY

Sun's Surface Is Stormy At Times of Total Eclipse

GREAT storms sweep the sun's surface at the time of a total eclipse, declared Dr. S. A. Mitchell, director of the Leander McCormick Observatory of the University of Virginia, in a lecture given under the auspices of the Smithsonian Institution.

Evidences of extreme solar activity have been obtained from photographs made during recent total eclipses, especially as shown by the coronal streamers and the lower but more intense flaming outbursts known as prominences. A comparison of all these photographs, said Dr. Mitchell, shows that the great activity of the sun was found not only at eclipse time but persisted throughout the whole period of four days covered by the plates.

Despite all the study that has been lavished on the corona, the great extension of pearly light around the sun visible only during a total eclipse, scientists are still in considerable doubt as to its real nature. That its great

domes and streamers are in some way linked with the flaming prominences of the sun's body itself was suggested long ago, but the nature of the connection is still obscure. Photographs taken during one recent eclipse "demonstrate the fact that the longest coronal streamers, on which the shape of the corona more or less depends, are always located near prominences but are not necessarily exactly connected with the prominences which at the time of the eclipse are of the greatest height."

Astronomers' inability to answer all questions about solar phenomena observable during an eclipse should not be held too hard against them, Dr. Mitchell indicated. If there were now living any one astronomer old enough to have started his work in 1842, when really scientific eclipse observations be-

gan, and if he had "taken in" all total eclipses since that date, with the average amount of bad luck with the weather, he would in that near-century have had only about one hour's observation-time of the totally eclipsed sun.

Typical of the sun's unsolved mysteries on which data obtained with total eclipse observations provide only the merest hint, is the nature of the dark lines which appear in the spectrum of the light from the outer corona. Whether such observed dark lines really are coronal in origin or whether they are produced by the scattering of sunlight in the earth's atmosphere is still uncertain. Probably they originate, indeed, in the corona but the present evidence is not wholly conclusive, said Dr. Mitchell.

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ARCHAEOLOGY

Connecticut Yankee Steps Into Ancient Literary World

Young Scholar Learns To Read Rare Mayan Works That Escaped the Flames of the Spanish Conquerors

A CONNECTICUT Yankee is stepping across the centuries, not into King Arthur's court but into the literary world of the Mayan civilization.

He is having the thrill of reading slowly—but very surely, as he believes—words in Mayan books that were last read and understood by Mayan Indian scholars in their temple libraries in Yucatan, centuries ago.

For one thing, he has learned to tell the words from the pictures, and that is no simple thing in a kind of writing that has often been called picture writing. On the brightly colored pages of a Mayan book, it appears, you can find our own popular modern method of telling a story by pictures and captions.

At the annual meeting of the American Anthropological Association, this young man from Wethersfield, Conn., Benjamin Lee Whorf, surprised his fellow research workers by reading off sentences from two of the famous Mayan books. Various scholars have attempted to read these books. Mr. Whorf's interpretation of the ancient text is entirely different from anything that any one had heretofore found on the Mayan pages. To account for his

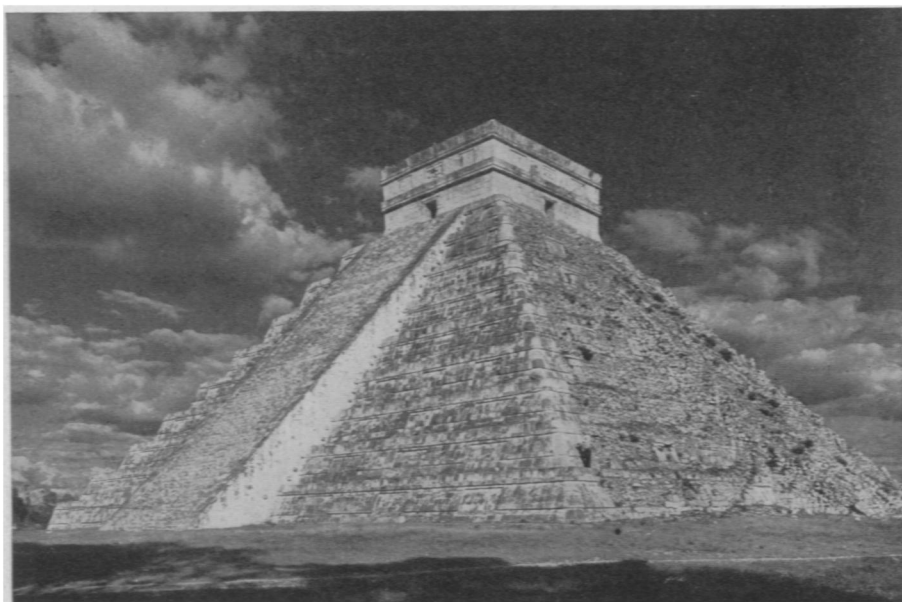
reading, he carefully analyzed his method of deciphering no less than 41 Mayan words.

Study of ancient languages began as a hobby with Mr. Whorf, and he has gradually become more and more engrossed in America's own prize puzzle,



BENJAMIN LEE WHORF

He says: "Mayan writing is phonetic."



HOME OF LEARNING

In lofty temples like this, in the Mayan cities of Yucatan, America's earliest scholars wrote and read learned books. Out of the thousands of books these Indians treasured, only three have survived to offer twentieth century America a glimpse into an ancient literary world. This is an official copyrighted photograph of the National Geographic Society.

the writing system of the Mayan Indian civilization.

Backing enthusiasm with technical training, Mr. Whorf has plugged at university courses to learn how the Babylonians, and other ancient people, constructed their writing systems, and he is now working as an honorary fellow at Yale. One of his reports on the Mayan writings was published by Harvard University.

Only Three Books

The main goal is to read three Mayan books. There are no more. There are inscriptions in addition to date recordings on some of the stone monuments of the Mayas that archaeologists unearth in ruined cities in the American tropics. But the greatest interest attaches to the three Mayan books that escaped the flames when Spanish missionary zeal demanded that Mayan Indians make bonfires of all heathen works.

In one city alone, four thousand books of the Mayan literature were lost in these fires. When the crusade was over, the amazing erudition of a self-made American civilization was almost lost to history. In astronomy, calendar making, literature, these Indians could hold their own with any of the world's famous civilizations.

Three books, so far as any one knows, are the only exhibits from those libraries that escaped, and the three found their way to Paris, Dresden, and Madrid. The fate of Madrid's Mayan book, endangered by Spanish War, has not been learned. The book was separated in two parts, and treasured by two libraries in Madrid. It may have been removed from the city with numerous art works that have been saved. Facsimiles of the three Mayan books safeguard the contents for science, even though accident may befall the valuable originals.

It is not correct, says Mr. Whorf, to think of the Mayan Indians as drawing pictures for their writing system. They built their writing system on a much harder and more advanced principle. It was phonetic, with each sign standing for a sound or syllable.

Early Theory

Thus Mr. Whorf revives a very early theory about the Mayan writing. Yucatan's most famous colonial priest, the Spanish Bishop Landa, wrote down 27 characters of Mayan writing and explained that they represented sounds similar to those in the Roman alphabet. But when American scholars 50 years ago launched an intensive attack to explain the Mayan writing, they could not find that the bishop's Mayan al-

phabet was of any help. Their efforts failed. And so the phonetic theory of Mayan writing came to be mainly discounted.

Phonetic Writing

"The Mayan writing is phonetic," explained Mr. Whorf. "But Landa was wrong in thinking that 27 signs made a Mayan alphabet. In fact, there was no Mayan alphabet at all.

"The Mayas used several hundred signs in their writing. It was rather like the cuneiform writing of Babylonia in that respect.

"So far, I have deciphered enough signs to spell out about 100 written words in Mayan texts. Using these words I have read certain passages in the Mayan codices, as the books are called."

One significant fact about Mayan writing, which his studies bring out, is that the Mayas often had several ways of writing the same word. Just as today we write "through" or "thru" and recognize both as the same word, or just as we might conceivably write "coffee" or "kawphy" and read them both the same, so the Mayas often varied their spelling.

Word Spelt Two Ways

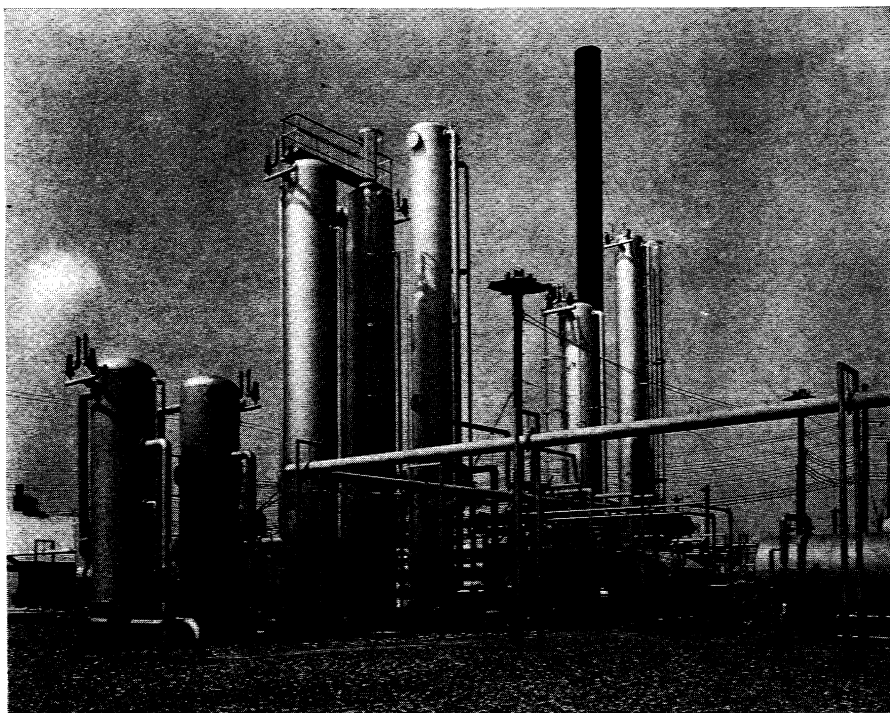
On a piece of paper Mr. Whorf quickly sketched two ways that a Mayan Indian could write the word "sit." It can be spelled, he explained, with different combinations of signs, and the result, to uninitiated eyes, gives very different appearances.

Complete deciphering of Mayan writing, Mr. Whorf maintains, means not merely recognizing what a sign means, but knowing how it sounded when a Mayan Indian read it aloud. In time, he believes, it will be possible to read the ancient books aloud. Living Mayan Indians, who have lost the literary and scientific heritage of their ancestors, still retain most of the speech forms, and can be of considerable help in fitting Mayan sounds to signs.

Some pages in the Mayan books are inscribed with chants or verses, and illustrated by series of pictures, Mr. Whorf says. The Indians repeated the chants in stanzas, like songs chanted by some Indian tribes in the United States today.

Mayan Song Described

From the Spanish-owned Mayan book, the Codex Tro-cortesianus, Mr. Whorf read this line: "God I our lord implants staff in ground." God I is just an alphabet (*Turn to page 125*)



FOR SALVAGE

With silver towers aimed at the sky the new crude oil stabilization plant at Basile, La., enables oil men to salvage valuable gases from petroleum which formerly were lost. It is estimated that \$100,000,000 annually could be saved by the nation-wide adoption of similar equipment.

CHEMISTRY

Lost Vapors Captured To Conserve Oil Resources

HARD-FISTED oil men looking for ways to earn more dollars and the more visionary people who rightly worry about the future oil and natural gas resources of the country can alike enjoy a new type of oil stabilization and gasoline recovery plant just opened at Basile, La.

Adoption of the equipment throughout the nation would result in \$100,000,000 annual economies, it is estimated. And with a single further stage of equipment the plant will soon be ready to put back into the earth the vast wastage of gas and light volatile petroleum vapors which hitherto have been considered a regrettable but unavoidable loss whenever an oil well was drilled and opened up.

Millions of dollars in the petroleum industry, it is pointed out by oil men, change hands on the measurement, or gauging, of oil. Previously and still widely today this measurement is done at atmospheric pressure and continu-

ally the lighter, gaseous elements of crude petroleum evaporate into the air and are lost. Somebody, somewhere along the line from the well to the final purchaser, has to pay for this loss.

Equipment already installed automatically measures the gases and fluids which come off from the well, processes the volatile vapors and is recovering in the form of gasoline about 60 per cent of those petroleum products which formerly were lost in gauging in tanks at atmospheric pressure, either at the well or in transit.

Under the new arrangement the previous setup of separate tanks and separators at each well is now abandoned. Each production well has its contents piped to a central plant where, under pressure, the gas and oil content is measured. This metering system is the basis for royalty payments.

At the central plant, following measurement, the gas and oil are put into a common pipe system and kept

under pressure until the lighter vapors are recovered from the crude oil. Analyses of the sample taken from the individual separators is checked against the output of this central recovery plant to provide an oil audit for the owners of each lease.

The crude oil, thus stabilized by the removal of its more volatile portions, is ready for shipment with little further evaporation loss. Previously such loss was estimated as 18 per cent of the gross production.

In areas where there is no market for natural gas recovered by the new process an additional apparatus can be attached and the gas piped back under pressure into its original "home" in the well. The plant is operated by the Continental Oil Company.

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letter name that a German scholar made up for this particular Mayan god. Mr. Whorf has not yet discovered how this god's name was pronounced in Mayan.

From the Mayan book in Dresden, Germany, he offered this sample of Mayan song: "The lightning monster with the vessel of the rain destroys."

Pictures beneath each line show the events told of, he explained, but the translation does not depend on the pictures, or appearance of the characters, but solely on the way the characters are put together, which is to spell the words of these Mayan sentences.

Beyond illustrative examples, this man who is ambitious to read the Mayan "classics" is not yet ready to read the Mayan books publicly.

"There is much work to be done," he says, "before the language can be regarded as fully understood. Hundreds of signs remain to be deciphered. And I feel the time has not come to tell more about the contents of the books as they are unfolding themselves."

Science News Letter, February 20, 1937

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