

a warm, moist climate, and the flints were of a type elsewhere associated with the earliest finds of Neandertal men.

The two together are believed to indicate that Palestine man probably lived during a warm period when the glaciers of northern Europe had retreated for the time being, which puts him back among the earliest of human beings whose bones and cultural remains are at all well known.

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## ARCHAEOLOGY

## Chinese of New Stone Age Lived Like Indians of West

CHINESE of Shansi province, in northern China, were farmers in the New Stone Age as they are farmers now. They lived primitively, and some elements of their culture are suggestive of those of the American Southwest, though there is no direct connection between the two.

Explorations by archaeologists of the Freer Art Gallery, a department of the Smithsonian Institution, have shown how Chinese lived and worked among the fine-soiled loess bluffs in the Shansi region, some 2,000 years ago. Their findings are incorporated in a report, just published, by C. W. Bishop, associate curator of the Gallery.

They lived in round pit dwellings, as some of the ancient Southwestern Indians did. These Chinese pit dwellings averaged ten feet deep, were shaped like bee-hives, and had plastered walls. Entrances were at the top. Modern natives of the district dig their dwellings, like artificial caves, into the sides of the loess bluffs.

They cultivated the soil with stone and shell hoes, and used stone and shell in making their arrowheads. Other materials used in their tools were horn, bone, and presumably wood.

Their principal crop seems to have been millet, still widely used for food in northern China. Their only domestic animals were pigs and dogs.

They knew the arts of spinning, weaving, basketmaking and pottery. In the latter craft, they first made pots by the "coil" method, but in the later days of the New Stone Age developed some kind of potter's wheel. Hemp seems to have been their principal, perhaps their only, source of fiber for cord and cloth.

Bones of the dead, found piled helter-skelter, suggest that they may possibly have practised ceremonial cannibalism.

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## GEOLOGY

# Continents Rise and Sink Through Long Cycle of Ages

## Evolution of Grass Called Greater Event Than Raising of Highest Mountains

GRASS was glorified above earth's highest mountains, in the address that opened the annual meeting of the British Association for the Advancement of Science. The speaker was the Association's president, Dr. W. W. Watts, professor of geology at the Imperial University of Science and Technology, South Kensington.

"It is perhaps not too much to say that the magnificent outburst of energy put out by the earth in the erection of the Alps, Andes, and Himalayas in Tertiary times was trivial in its influence for man's advent and his successful occupation of the earth in comparison with the gentle but insidious growth of 'mere unconquerable grass' and its carpet of 'wise turf' which in some form clothes by far the greater part of the land of the globe," Prof. Watts declared.

The speaker based his estimate on the importance of the grasses on the evolution of mammals, particularly those used by man for food, clothing, burden-bearing and many other purposes. Before grass evolved, comparatively late in earth's long history, herbaceous animals were browsers, and mostly solitary. When grass came, some of them modified their habits to feed on it, and in time they became gregarious, thus forming the foundation of flocks and herds even before man appeared on the scene to claim leadership of those flocks.

In the course of his address, Prof. Watts undertook to find a geological mechanism to account for the tremendous changes in the extent of the sea during the course of geologic time. In some ages, the sea covers most of the land areas; in others, it recedes until it occupies only the true ocean basins themselves. The present is a time of such recession.

The explanation offered is that the continental land masses float, like great rafts of rock, on an underlying layer of rock of a different kind. This underlying massive stratum passes through phases of solidification and liquefaction, as a lake in northern lands is ice in winter and water in summer. During the liquid

phase, the continental rock rafts sink lower, and the sea partially covers them. During the solid phase, the masses rise higher, and the sea drains off again.

These phases are very slow, the time from change to change being measurable in scores or even hundreds of millions of years. Their comings and goings are due to the development of internal heat in the underlying stratum, caused by the radioactivity of the rock material itself. When enough heat has accumulated, they liquefy after a period of slow "boiling up" lasting many ages, they cool and solidify again.

At present the earth is in the "solid" phase, with the continents floating high.

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## PSYCHOLOGY

## Spiritist Mediums May Be Split Personalities

ARE SPIRITIST mediums persons with dual personalities? Are their "controls," the shadowy personalities that purport to give them messages from the other world, merely their other, "opposite" selves?

A suggestion that this may be the case was offered before the meeting of the British Association for the Advancement of Science, by Whately Carington, well-known English psychologist.

Mr. Carington subjected a considerable number of mediums, both in their normal condition and in the trance state, to what psychologists call the word-association test. This consists in the examiner saying one word, and the subject answering with the first word that comes into his mind. The answer gives a picture of the mental state of the subject.

Thus, to the word "ball," a small boy might answer "bat," while a debutante might answer "dance," and a soldier "cartridge."

A person with dual personality, who is his "own opposite" in the second mental state, might give opposite reactions to the same test word. Take the most fa-

amous dual personality in fiction, Stevenson's Dr. Jekyll and Mr. Hyde, and say "cane." The benevolent Dr. Jekyll might respond, "take a walk," while the murderous Mr. Hyde would exclaim, "beat him up!"

This is the kind of reaction Mr. Carington got from his mediums. In their normal state, they gave one set of re-

actions to test words. In their trance, their "controls" gave the opposite set of reactions. This led Mr. Carington to suspect that a medium's "control" is no messenger from the spirit world, but simply an ordinarily suppressed "other self" who gets leave to speak up during the trance condition.

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#### PSYCHOLOGY

## Scientists Do Best Work During Early Maturity

**G**REATEST achievements in science and literature are most commonly the work of men in their early youth, psychologists at the meeting of the American Psychological Association learned from a report by Dr. Harvey C. Lehman of Ohio University.

A sort of scientific or literary "batting average" was computed by Dr. Lehman for outstanding achievements in chemistry, physics, short story writing, and other fields of creative work. Each year of the scientist's life would count as "one time at bat" in this computation. Each important contribution would count as a "hit."

Chemists reached their highest batting average between the ages of 27 to 39. When only the 100 most important chemical discoveries or achievements were considered, Dr. Lehman found that they were made most frequently by persons who were about 30 years old at the time of their invaluable contributions.

This does not mean that if an individual has failed to make an important contribution to chemical science by the time he is 35 or 40 that he will never do so, Dr. Lehman pointed out. Among the scientists who were responsible for noteworthy contributions to this science, there were 100 who were credited with just one major contribution each. Of these, 34 per cent. were over 40 at the time of their single contribution, 19 per cent. were past 50; 5 per cent. were over 55; and one individual was 69 years old.

At the other end of the age range was William Perkin, who at 18 discovered the first coal-tar dye and gave the initial impetus to the present great dye industry.

For physicists, the age of highest "batting average" is attained between 30 to 34. For mathematicians it occurs between 28 and 38.

For inventors, from 30 to 34 are the most productive years. Thomas A. Edison, whose long productive period lasted

for more than 60 years, had his most creative year when he was 35. Between the time he was 33 to the time he was 36, Edison took out a total of 312 patents, more than a fourth of all those he received during his lifetime.

The writers of short stories attaining the distinction of listing among the "best short stories" are likewise young when they make their contributions.

Their highest "batting average" comes between 30 and 34 years. The writers of great poems are mostly persons between 22 and 35.

The single exception, among the fields studied by Dr. Lehman, seems to be astronomy. Astronomers reach their most productive years between 40 and 44.

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#### PSYCHOLOGY

## Confusion of Causes Hampers Treatment of Mental Ills

**P**ROGRESS toward the cure of the mentally sick is often hampered because the attending specialist is himself mentally muddled, and does not distinguish between the real causes of the conditions he is treating, and the mere symptoms that appear on the surface.

This challenge to psychologists and psychiatrists was laid before the meeting of the American Psychological Association by Prof. Knight Dunlap of the Johns Hopkins University.

One of the fruitful sources of this confusion about the true causes of mental afflictions has been the proneness of scientists and medical men who deal with abnormal psychology to swallow whole the plausible theories of certain fashionable schools of psychiatric thought, and

#### BIOPHYSICS

## Four Types of Brain Wave Formed During Sleep

**W**HEN you sleep, your brain's activity shows either "saw-tooth," "random," "spindles" or "trains" types of brain waves, studies at the Loomis Laboratory, Tuxedo Park, N. Y., by Alfred L. Loomis, Prof. E. Newton Harvey of Princeton University and Garret Hobart have revealed (*Science*, Aug. 30). The four terms denote the appearance of the wavy records harmlessly obtained with special electrical brain wave apparatus.

Whether your brain waves show saw-tooth, random or other patterns in the records is apparently connected with the different levels of consciousness or brain activity going on while sleeping. The saw-tooth type of brain wave appears only in children just after they have fallen asleep.

In the comparable stage of sleeping in adults the brain waves appear as trains. Gradually, as sleep becomes more profound, the trains become less numerous and finally change to the random type of wave pattern.

A sudden change from the random to trains type of wave can be obtained by talking to the sleeping person. The random type of wave, it is found, predominates in the brain wave patterns of children and young people in deep sleep.

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then make their facts fit the theories. It is high time, he declared, to dig out the facts, and let theories be developed that will bring such facts into useful relationships.

Examining the causes of neuroses, Prof. Dunlap divides them into two main categories, primary causes and accessory causes. Primary causes are not necessarily displayed in symptoms at all; they are often physical rather than mental, and may be hidden from both patient and physician. They may include such things as malnutrition or physical illness during childhood. A tragically large number of cases, Prof. Dunlap believes, are traceable to the operation of circumcision, performed on boy babies as a well-inten-