

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-

tioned, routine measure of prophylaxis.

Accessory causes the speaker divided into several classes: predisposing, precipitating, determining and sustaining causes. Predisposing causes may precede the primary causes, but serve merely to make a set-up for them, just as in the field of strictly physical ailments a general run-down condition may serve as the predisposing cause which makes possible the activities of tuberculosis or typhoid germs, which are the primary causes of their respective diseases.

After the primary cause has had its opportunity to take hold, some seemingly minor thing, like a bad fright or a severe disappointment, will serve as a precipitating cause. And an equally accidental occurrence may select which of several possible sets of symptoms the patient will display; this would be a determining cause. Thus, a man might be all set to become a "mental case," but it would be a matter of a chance whether he would take to hallucinations, or "seeing things," or whether he would develop the distressing nervous twitches called tics.

Finally, after a primary cause has been ferreted out and cured, there may have intervened some other factor that will keep the diseased condition going. Such a thing would be a sustaining cause.

Prof. Dunlap declared his conviction that the relatively poor showing made by mental medicine so far is due to a considerable extent to the preoccupation of psychologists and psychiatrists with immediate symptoms and their failure to dig deeper to find the real primary causes.

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## BIOCHEMISTRY

## Second Male Sex Hormone Will Soon be Synthesized

### Exact Analysis Points Way to Prevention Of Distressing Abnormalities in Human Beings

**M**ALE SEX characters will be brought under control in their development, and distressing abnormalities in behavior will be subjected to experiments looking toward their elimination from the human stock, as the result of discoveries made in Swiss and Netherlands laboratories, reported at the San Francisco meeting of the American Chemical Society by Dr. L. Ruzicka of Zurich.

The basis of his statement is the definite determination of the chemical composition of a male sex hormone isolated last June by the Netherlands scientist, Prof. Ernst Laqueur. In the opinion of Dr. Ruzicka, the synthetic preparation of this hormone in sufficient quantities to provide ample material for studies of its effect in treating sexual abnormalities of male human beings, will be merely a routine matter requiring a few weeks or months.

This hormone is the second chemical messenger having to do with the development of male sex characters upon which Dr. Ruzicka has worked. The first was isolated from kidney secretion in 1931 by the German chemist Dr. M. Butenandt.

In 1934 Dr. Ruzicka and his assistants succeeded in producing this hormone in the laboratory from cholesterol, a widely distributed organic substance found abundantly in the yolks of eggs.

Through the experimental material thus provided, it was possible to demonstrate that there must be two male sex hormones, one present in kidney secretion and the other in the sex glands themselves. The isolation of this second hormone proved to be difficult, partly because it occurred in such small quantities, roughly in the ratio of one part in a million of glandular tissue.

Comparison of the effect of the artificially produced hormone with that occurring naturally in the tissue of male sex glands indicated that the difference between them was more a matter of potency than of chemical nature. In the light of this and other findings, Dr. Ruzicka explained, he predicted the empirical formula of the second hormone and prepared some of it in the laboratory.

When Prof. Laqueur succeeded in isolating the naturally formed hormone from gland substance, he found that it conformed closely to the formula predicted by Dr. Ruzicka, and the natural hormone could be converted into the substance prepared by Dr. Ruzicka by a simple process of oxidation.

As a result of these studies, the Swiss scientist stated, it is safe to say that both sex hormones can be manufactured in the laboratory. Both of them, like theelin, the female sex hormone, are derivatives of the widely occurring substance cholesterol. The male hormones differ in formula by two atoms of hydrogen. The female hormone contains six less atoms of hydrogen and one less of carbon, but has not yet been prepared synthetically.

The action of the second male sex hormone is so powerful that it will increase the weight of certain sex organ tissues in abnormal rats by more than four thousand per cent. Whatever use may be made of it in the treatment of human beings, Dr. Ruzicka warns, will have to await results of long and careful experimentation.

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#### COLLARED FOR HIS OWN GOOD

*A light wooden collar solved the problem of how to prevent this monkey in New York Zoological Garden's Animal Hospital from disarranging with his teeth the bandages upon his broken arm. (Courtesy Bulletin N. Y. Zoological Society.)*