

moving at a much slower linear velocity quickly enough to get the picture.

In apparatus developed at Massachusetts Institute of Technology, the film is pulled past an aperture, and each time the light flashes, a sharp exposure is made. The film is caught by the light for so short a time that it does not streak.

Stroboscopic photography is a boon to the engineer and scientist who can

take valuable pictures in a small field illuminated only by the comparatively weak light of the stroboscope. Time will tell whether the new method can be improved successfully to invade portions of the motion picture field. Its simplicity and lack of shutter and mechanism to hold the film mechanically still for each exposure and each projection are assets.

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is discharged from the atom as a beta particle. The proton partner of the ousted electron remains in the nucleus. At other times the atom gets rid of mass by ejecting a bundle of two neutrons, or two protons combined with two electrons, which are equivalent to a helium heart, and smash outward in the form of an alpha particle.

This disintegration continues with radioactive elements changing into lighter ones until they reach a stable state as some lighter element. Radium in this way turns into lead.

This new Heisenberg theory provides the first satisfactory explanation of the mechanism of radioactivity. Under the Heisenberg theory the number of protons in each nucleus is equal to the atomic number, while the proton and neutrons together determine the atomic weight.

Prof. Heisenberg, who came to the United States from the University of Leipsic especially for the lectures at the University of Michigan, will publish the details of his theory in the *Zeitschrift für Physik*.

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#### EUGENICS

## Coeducational Alumni More Nearly Replace Themselves

### Men Associating With Women At College Fall Short Of Reproducing Their Groups By Only 18 Per Cent.

**G**RADUATES of coeducational colleges have more children, and come nearer to replacing themselves as a population group, than do graduates of colleges for men alone or for women alone.

This conclusion has been reached by Caroline H. Robinson of Tunkhannock, Pa., after a statistical study of marriage and birth rates among 765 graduates of a coeducational college.

It is, of course, notorious that educated people do not have enough children to replace themselves. However, in this group, offspring of the men fell only 18 per cent. short of full replacement, as contrasted with a 32 per cent. deficiency among Harvard men. Among the women, the deficiency may be set at 41 per cent., a little worse than Bryn Mawr but far better than at the other women's colleges, where replacement is in some cases defaulted by as much as 55 per cent.

The men at this coeducational college married exactly as much as the general male population of the United States, while one-quarter of all Harvard graduates remain single, as against two-fifths for women's colleges.

Hard times has much to do with the small-family or no-family problem among college graduates, the speaker stated. After the panic of 1893, the spinster percentage at her coeducational college rose to two-fifths. And at all times, late marriage and small families seem to be the rule, especially for the men. Among all the men only two, both college professors, had more than five children.

Wealth was favorable to fertility in both men and women. Eighty-one men on the "special contributors" list of the college had more children than necessary to replace themselves, and 52 women on the same list had almost enough. The five women who had six children or more were all wealthy.

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#### PHYSICS

## New Theory Explains Radioactive Disintegration

**A** NEW THEORY of why radium spontaneously explodes and disintegrates into other chemical elements was proposed by Prof. Werner Heisenberg, the young German originator of quantum mechanics and the principle of uncertainty, who lectured at the summer physics symposium of the University of Michigan.

Prof. Heisenberg visualizes the heart of the atom made up exclusively of protons, the positive particles, and neutrons, the newly discovered close combinations of proton and electron. Old ideas had the atomic nucleus built of protons and electrons, but Prof. Heisenberg holds there are no electrons or negative units in the atomic hearts except combined with protons to make neutrons.

He explains radioactivity by the fact that there are too many neutrons in relation to protons in the hearts of heavy elements. They are unstable. At intervals, this instability causes a neutron to burst and out rushes an electron which

#### CHEMISTRY

## Anti-Oxidizing Substance Found for Anti-Knock Gas

**P**A R A-BENZYLAMINOPHENOL.

That's what you're going to get in your anti-knock gas. It will keep the anti-knock properties in, and it will keep gumminess out.

At the recent meeting of the American Chemical Society, two Chicago petroleum chemists, Dr. T. H. Rogers and Dr. Vanderveer Voorhees, told of their search for something that would make cracked gasoline keep better and yet leave its anti-knock properties as nearly intact as possible.

Cracked gasoline has a tendency to combine with oxygen from the air, building up gummy substances that "varnish" the insides of feed lines, and otherwise make trouble. Gas that has thus gone gummy also loses much of its anti-knock value. Various treatments, notably one using sulfuric acid, prevent the gumminess, but also kill the anti-knock.

Drs. Rogers and Voorhees have tried a large number of oxidation-preventing substances, and their choice as the most efficient, both for stopping gumminess and for not harming anti-knock, is para-benzylaminophenol.

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