

## PHYSICS

# Fast-Moving Positive Particles Produce New Kind of X-Rays

But Positive Ions Driven By Million Volts Yield Radiation Comparable Only With 10,000-Volt Negative X-Rays

**P**OSITIVE X-rays can now be produced at a million volts instead of the few thousand necessary for ordinary or "negative" X-rays.

Positive X-rays are produced in a vacuum by the impact of positively charged ions, or atoms that have lost an electron, on a metal target; whereas negative X-rays, found by Roentgen in 1895, are produced by fast electrons.

Dr. W. M. Coates and Prof. E. O. Lawrence of the University of California have stepped up mercury positive ions to 1,000,000 volts and on allowing them to strike targets of various elements have observed that real X-rays are given off.

Ever since Roentgen's original discovery of the common "negative" X-ray that has played such an important part in modern medicine, physicists have been attempting to produce these rays by positive as well as negative projectiles. Sir J. J. Thomson, as early as 1914, observed a non-penetrating radiation from targets struck by protons or hydrogen positive ions, but the very softness or lack of penetrating power of the radiation proved that this was not a positive X-ray.

Even Drs. J. D. Cockcroft and E. T. S. Walton of Cambridge University, the pioneers in nuclear disintegration by high velocity protons, found no appreciable quantity of this positive X-radiation at projectile speeds equivalent to 700,000 volts. It remained for F. L. Verwiebe of the University of Chicago to settle the question as to the exact nature of the Thomson radiation resulting from proton bombardment.

At energies up to 50,000 volts he found that the hardest radiation given off was not due to the metal being used as a target but to the changes in the bullets themselves at the time of the impact. This is to be contrasted with the effects of Drs. Coates and Lawrence where the radiation has without doubt the same penetrating power as our ordinary X-rays, and where, from targets of the lighter elements the rays are characteristic of the targets, a true X-ray ef-

fect. However, for the heavier targets it is again the bullet itself that breaks up.

At present there are no prospects of utilizing this new method to produce better or cheaper X-rays. The process is remarkably inefficient as a million volt positive ion will produce only approximately the same quantity of X-rays as a ten thousand volt electron.

The scientific solution of the old problem as to the previous non-existence of positive X-rays is twofold: higher voltages and heavier projectiles.

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## ANTHROPOLOGY

## Exposition Visitors Examined For New Racial Type

**H**AS A NEW racial type been smelted into being out of the quality, mediocrity and dross poured into the American melting pot?

This is the question that visitors from all parts of the United States are helping the Harvard anthropometric laboratory answer at its station on the grounds of the Century of Progress Exposition.

As the visitors file through the station, in charge of C. Wesley Dupertuis, more than ninety measurements and observations of physical characteristics are

## CHEMISTRY

## Blast Furnace Gets Phosphorus Cheaply From Tennessee Rock

**P**HOSPHORIC acid of a higher purity than ever obtained before can now be produced economically in large quantities by means of a process perfected by Henry W. Easterwood, chemical engineer, and his associates. This acid, indispensable in the manufacture of certain fertilizers, foods, and drugs, is obtained from phosphate rock which occurs in large quantities in Tennessee.



MELTING POT TEST

made. Thus a cross section of American racial types is being charted which is expected to determine for the first time whether there is a distinct American racial type and, if so, what its characteristics are.

From data already taken it appears that Americans are revealing a common racial type which is becoming more and more round-headed instead of Nordic long-headed.

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Although it has been the desire of chemical engineers for sixty-five years to be able to manufacture phosphoric acid cheaply, it remained for Mr. Easterwood and his associates successfully to adapt the blast furnace principle to the problem and make the dream a reality. As a result a furnace capable of producing 250,000 pounds of phosphorus pentoxide per day, which is converted

directly into acid in the process, has been put into operation at Nashville.

The use of the blast furnace was first suggested in 1868 but was deemed commercially impracticable at that time. Hence for thirty or forty years the manufacture of phosphoric acid was carried out in the electric furnace.

In 1917, the Bureau of Soils of the Department of Agriculture became interested in the subject because of the desire for producing a concentrated phosphate fertilizer. The Bureau went on the theory that ordinary silica sand heated to a high temperature in the presence of carbon was capable of expelling phosphorus from the rock. An oil fired furnace gave promising results and inspired chemists to work toward the development of the present blast furnace burning coke under an enforced air blast.

Several furnaces were built by Mr. Easterwood and his associates before the ninety-five foot monster at Nashville came into being. Many difficulties had to be overcome of both a chemical and engineering nature. As finally developed the process consists of burning briquettes composed of phosphate rock, silica sand, and coke to phosphorus pentoxide and treating the product with water to form the phosphoric acid.

The acid, because of its chemical properties, must be shipped in rubber lined cars. The last step is its conversion into phosphate compounds for fertilizers, food purifiers, and drugs.

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#### ICHTHYOLOGY

## Fish Spins on Tail Over Sea Surface

**A** FISH that seems to walk on its tail is one of the new mounted specimens on exhibition at the Philadelphia Academy of Natural Sciences. It is a ribbon bill fish that can spin along upright on the surface of the sea for several hundred yards and thus appears to be walking on its tail.

This fish is the "whippet" of the so-called "hound" fishes—a long, thin creature that spends its life on or near the surface of the sea, skimming along at a rapid pace and every once in a while "walking" as above mentioned. It is not far removed from flying fishes, which appear to use their fins as wings and present a most beautiful sight when seen in large numbers in tropic waters.

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#### PSYCHOLOGY

# Unpredictable Human Factor Attacked by Psychologists

## 300 Studies Reviewed by Dr. Watson Begin to Penetrate Mystery of Man Which Obscures Events of the Future

**T**HE SUCCESS or failure of NIRA, as well as the other magnificent or trivial projects of mankind, depends in the last analysis upon the nature of man himself. The human factor, most unpredictable of all elements, enters inevitably into all calculations for the future of civilization.

The integrity of individual bank officials has a most far-reaching effect upon the credit relations and business of the nation. The courage, honor, decisiveness, and leadership of public officials are basic to good government. The cooperation, self-reliance, optimism, persistence, and industry of John Doe are essential to democracy.

### Man a Mystery

Yet man still remains a mystery. Shall we depend on Smith to run the Chicago office for us? Can Brown be relied on to make good his note? Is Jones lying when he says he will renew the contract? The man who knows the answers to such questions has a great advantage.

Scientists are now prolific in research to provide tools for measuring the hearts of men. Dr. Goodwin Watson of Columbia University, reviews in the *Psychological Bulletin* more than 300 studies which psychologists have published on this subject during the past two years.

Rating scales and "behaviorgrams" for measuring reputation, which is the outward sign of personality, have received a generous share of attention. Studies of neurotic tendencies reveal the fact that this abnormality so common to man has no apparent relation to school success, professional success, ability in art, or pacifistic attitudes.

Priests in training in a Catholic seminary were found to have the introvert's personality, centered within the self rather than on the outside world. Like neurotic tendencies, introversion tests are remarkable for their lack of relation to other factors of personality. The recent studies show that they have no signifi-

cant relation to art ability, hypnotizability, choice of friends, social adjustment, susceptibility to caffeine, delinquency, or school grades. The notion that the introvert is more studious but cannot get along with other people thus topples.

One psychologist has made a study of human happiness and has found that among 500 young men, the happier were steadier in mood, in better health, better adjusted sexually, more sociable, more interested in religion, more approving of their work and work associates. Others found that job insecurity and disagreeable supervisors were the main thorns in the work situation.

Moral knowledge was found not a function of age, and the traditional finding was confirmed that there is no relation between moral knowledge and delinquency.

Scales have been devised for measuring the attitudes of individuals and groups toward all sorts of matters, including God, the law, capital punishment, foreign nationalities and races, prohibition, Communism and birth control. The movies serve to change these attitudes, it was found.

### Individual Character?

One psychologist has attempted an analysis of human relationships as displayed when a number of persons cooperate in a common task.

"The promising feature of our present situation is the attention being given to the careful observation of conduct in more or less controlled situations," comments Dr. Watson. "Ratings come to be more and more observations of actual behavior and less and less based upon imaginary traits. . . . There is a slight increase, although not yet approaching the most desirable point, of studies in which groups of persons are examined in their interrelationship, recognizing that character does not exist in isolated individuals, but is a function of a social situation having a certain structure."

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