authentication and attribution of various objects of art and various articles of antiquity not necessarily artistic. The very observations made during restoration are among the most crucial observations in deciding whether a piece of metal, stone, wood or cloth is old or of recent origin.

OTHER RESEARCHES

In the few examples above we have tried to indicate the main points of difference between development research and fundamental or radical research. We might go on to tell you how these principles of radical research were applied to:

(1) Our researches on chromium plating and the discovery of the relatively narrow limits of catalytic agent quantities that must be added to the plating bath—a radically new observation, never before applied to any plating bath.

(2) Our various researches on tungsten, its crystal structure, crystal growth, its ductility, etc.

(3) Our research on bright nickel plating.

(4) On high chrome-irons.

(5) On electrolytic manganese.

(6) Our researches on corrosion of metals and various means of combating same, etc., etc.

NEW PROBLEMS

The world is full of new chemical and electrochemical problems that await the young investigator. Typical of these many "yet-to-be-solved" problems is the one on *rubber:* Although there are several synthetic rubbers that closely compete with the natural variety, a "complete" substitute is yet to be found. Might it not be worthwhile to investigate the possibilities of growing rubber trees in the temperate zone? We have had definite indications in our experiments that the tropical rubber tree, *hevea brasiliensis,* may be converted into a deciduous tree of the cooler climates by proper treatment and control of the soil constituents.

Among the numerous other problems that await the young lad with vision and courage are:

(1) The perfection of electric lighting ten times as efficient as any present type.

(2) An improved automobile gas engine operating at three or four times the efficiency of the present one.

(3) A paint for wooden structures that is rainproof and sunproof.

(4) An alloy of aluminum as resistant to fatigue as steel.

(5) A metal or other material to take the place of our rapidly dwindling resources of copper—or of lead.

(6) A material to take the place of leather for shoes with all the good, or even better, qualities of leather.

And many, many more problems.

Throughout the ages there have always been young men endowed with the research spirit or research instinct. Very often this is a latent talent that needs to be aroused. And the best procedure in arousing this most valuable talent is to become interested in one or the other phase of science or engineering and then to select one or the other individual topic and apply oneself diligently to this. But reading alone is not sufficient in preparing for research. The laboratory or workshop—no matter how primitive and incomplete—is a most essential adjunct. Reading without experimentation hardly ever leads to the desired results. On the other hand, experimentation with little or no library work frequently leads to radical discoveries.

And in conclusion let me say to the young man: The opportunities in research are greater to-day than ever before. And the chances of finding new products and new processes have never been equalled in the past.

OBITUARY

WILLIAM FRANCIS MAGIE
1858–1943

WILLIAM FRANCIS MAGIE was born in Elizabeth, N. J., on December 14, 1858, and died in Princeton on June 6, 1943. He was the son of William Jay Magie, a former chancellor of the State of New Jersey. He graduated from Princeton as valedictorian of the class of 1879, a class that had many other distinguished members, including Woodrow Wilson.

After graduation he remained in Princeton as assistant to Dr. Brackett, then Henry professor of physics. Having decided to make physics his life work it was natural at that time for him to go to Germany to pursue advanced work. He matriculated at the University of Berlin and took his doctor's degree under the direction of Helmholtz in 1885. His dissertation was an experimental study of the theory of capillarity.

Returning to Princeton he was appointed to an instructorship in physics during the presidency of James McCosh, advancing to a professorship in 1890. In 1889 Dr. Brackett founded the graduate school of electrical engineering at Princeton and devoted most of his attention to it. Although Dr. Brackett remained the chairman of the department of physics, Magie became more and more responsible for the actual administration of the department, and its expansion from very small beginnings was very largely

the result of his efforts. Dr. Brackett retired in 1909 and Magie was appointed Henry professor in 1910; he retained the chairmanship of the department until his retirement in 1929.

Soon after returning from Germany Magie began the investigations which formed his main contribution to research. These had to do with the properties of solutions, particularly their specific heats and volumes. He not only gathered together the various measurements made by others but made many determinations himself for the purpose of advancing the theory of solutions. His experimental work was done with great skill.

Magie was one of the small group of physicists who met in New York in 1899 to found the American Physical Society. He was a member of the first council of the society and its president during the year 1911–12. He was vice-president for Section B of the American Association for the Advancement of Science and gave his presidential address at the New Orleans meeting in 1905. He was also a member of the American Philosophical Society.

In university affairs in general Magie took a very active part. For many years he served as clerk of the faculty and was an influential member of many of the important committees of the faculty. In 1912 he was appointed dean of the faculty, a position he held until 1925. These administrative duties took so much of his time and attention that in his later years he gradually gave up his activities in research, although he always maintained a keen interest in the work done by his colleagues in the department.

His publications, other than his papers in his field of research, included a revision of the "Text-Book of Physics" by Anthony and Brackett, a text which was widely used in the latter part of the last century. He was a firm believer in the value of the study of physics for the general student, particularly the historical development of the principles. With this in view he wrote his "Principles of Physics" which gives an admirable account of the rise and content of physical theories. He was a master of clear and concise exposition in the best of English. He also translated Christiansen's "Theoretical Physics," and edited the important contributions of Carnot, Clausius and Thomson to the second law of thermodynamics for Harper's series of Scientific Memoirs. When the series of source-books in the sciences was being planned Magie was asked to contribute the volume on physics. This work he began on his retirement in 1929 and he devoted much time and energy to compiling and translating extracts from the memoirs that have had the greatest influence in the development of physics. He was often called upon to speak and write about the life and work of Joseph Henry, a subject of particular interest to him because of Henry's relation to Princeton.

The honorary degree of LL.D. was conferred upon him by the College of Wooster in 1916, and Princeton gave him the honorary degree of D.Sc. upon his retirement.

No account of Dean Magie's life would be at all adequate without an appreciation of his loyalty to his associates and the very real affection that all of us who had the privilege of working with him felt for him.

In 1894 he married Miss Mary Blanchard Hodge, of Princeton, who survives him, as does his sister.

E. P. ADAMS

RECENT DEATHS

DR. HARRY B. MELLER, research engineer of Pittsburgh, Pa., died on June 27 at the age of sixty-five years. Dr. Meller was chief of the air pollution investigation which has been conducted at Mellon Institute since 1923.

DR. W. E. SAUNDERS, ornithologist, of London, Ont., died on June 28 in his eighty-second year.

DR. ABBY LILLIAN MARLATT, from 1913 until her retirement in 1939 director of the department of home economics at the University of Wisconsin, died on June 23 at the age of seventy-four years.

DR. B. RAYMOND HOOBLER, until his retirement as emeritus professor in 1936 professor and head of the department of pediatrics of the College of Medicine of Wayne University, died on June 11 at the age of seventy-one years.

JOHN R. PETERS, petrographer at the U. S. Army Testing Laboratory, Mariemont, Ohio, died on June 24. He was twenty-seven years old.

SCIENTIFIC EVENTS

THE ENRICHMENT OF WHITE FLOUR

THE War Food Administration announces that a public meeting to consider the advisability of requiring all white flour distributed for human consumption to be enriched will be held at 10 A.M. on July 21 in the South Agriculture Building Auditorium, Washington, D. C.

Enrichment of white flour and bread has the endorsement of leading scientific and medical organizations, and of a large part of the milling and baking industries. Under wartime food conditions a further increase in consumption of white flour is expected, and its enrichment would aid in adequate consumption of important vitamins and iron. An inadequate