indivisible and international and that the large-scale work on power reactors now in progress, especially in Europe and the U.S.S.R., will bring with it declines in costs quite similar to those illustrated here. In the case of Europe, rising costs of coal and reluctance to depend on Middle East oil furnish powerful incentives for introducing nuclear power. Thus, Cockroft's cost prediction, already cited (*9*), actually means that in England nuclear power will cost about 10 percent more than the national *average* in 1960, the same in 1963, and 30 percent less by 1970. This timing is quite similar to that illustrated in Fig. 4.

Any substantial acceleration of atomic power usage by the early 1960's would actually require advance planning now. This does not appear in the offing, however, judging from current rather "bearish" industry comments in the technical press. It would seem, then, that we may anticipate a gradual increase in the real cost of power, followed eventually by a decline, as nuclear power really effects its commercial "breakthrough."

In the present analysis, only steam-cycle nuclear plants have been considered. No attempt has been made to estimate the costs of direct generation fission plants or of fusion power, which would probably also circumvent the steam cycle. Their feasibility is as yet not proven but, especially in the case of fusion power, may well be demonstrated in time to hasten the demise of the coal-fired steam plant even more.

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Albert Prescott Mathews, Biochemist

The death of A. P. Mathews in his 86th year, on 21 September 1957, has removed one of the last of those American scientists who came under German influence during the latter part of the 19th century. Although Mathews was granted his Ph.D. degree by Columbia University in 1898, he had previously (1895–1897) studied and traveled in Europe. At Marburg, he came under the influence of the German biochemist and Nobel prize-winner Albrecht Kossel, who greatly stimulated him, arousing his interest in the nucleus and in the physicochemical aspects of biology.

Mathews' early work had to do with the physiology of secretion, but he soon turned to a more general study of living cells. As a research scientist, Mathews published about one hundred papers on a wide variety of biochemical and biophysical subjects. Of his five books, three are biochemical in content—*Physiological Chemistry* (1915), *Principles of Biochemistry* (1936), and *Vitamines, Minerals and Hormones* (1937). The other two—*The Nature of Matter, Gravitation and Light* (1927) and *Gravitation, Space-time and Matter*—show his interest in philosophical subjects, an interest which permeated some of his shorter works. The book on *Physiological Chemistry,* first published in 1915, was the principal American text for nearly three decades. The sixth revised edition appeared in 1939. It not only served to present the properties of the chief groups of biochemical compounds but approached the subject from the viewpoint of the physical chemist. The book appeared at just the right time to inspire many a student to decide on a career in this rapidly growing and important subject.

Mathews was born in Chicago on 26 November 1871. His choice of biochemistry for a career was not a result of an early interest in either biology or chemistry. His father was a writer and music critic for the old *Chicago Daily News* at the time the paper was edited by Melville Stone, and Eugene Field, the poet, was a columnist. From his early years, Mathews was exposed to the best in music. As a very young boy he was taken to concerts and to the opera by his father, and he thus developed a taste for and love of music, which gave him the greatest pleasure in later life. Many of his friends were not aware of this aspect of his character but thought of him as being purely a scientist, a teacher, and a philosopher.

Mathews finished high school at the age of 15 and was ready to enter the Massachusetts Institute of Technology, where he intended to study electrical engineering. At M.I.T. he came under the influence of William T. Sedgwick, whose textbook *General Biology,* written in collaboration with E. B. Wilson, first appeared in 1886 and was widely used in schools and colleges. This influence undoubtedly changed the direction of Mathews' career from the purely physical to the biological sciences. He was no doubt influenced by his grandfather, a physician, with whom he spent his summers. The two discussed medical problems, and young Mathews went the rounds of patients with his grandfather. Thus, his medical, biological, and chemical interests, and his strong leaning toward physical chemistry determined that Mathews should become, first, instructor and then assistant professor at the Medical School of Tufts College, later at Harvard Medical School. He went to the University of Chicago in 1901, finally becoming head of the department of physiology, later head of physiological chemistry, a position that he held from

1907 to 1918. During World War I he served as captain in the Quartermaster Corps for a short time. In 1918 he accepted the position of Andrew Carnegie professor of biochemistry and chairman of the department at the University of Cincinnati—a position held until his retirement in 1939.

Mathews' Ph.D. thesis at Columbia University was entitled "The Physiology of Secretion," and was published in 1898; in 1895 he was coauthor, with E. B. Wilson, of a long paper on "Maturation, Fertilization and Polarization of the Echinoderm Egg"—a title indicating his interests in biological matters. Over the next 20 years his studies dealt with salt effects in cells and with the physical chemistry of living systems; for these studies he used fish, sea urchin, and starfish eggs as material. This work was carried out at the Marine Biological Laboratory at Woods Hole, Massachusetts, where Mathews spent his summers for many years, as an associate and intimate friend of the great biologists who made that laboratory renowned throughout the world. He lived with his charming wife and daughter in his cottage on Buzzards Bay Avenue, next to that of T. H. Morgan and across the street from that of E. B. Wilson, while E. G. Conklin and G. N. Calkins lived near by. Jacques Loeb, whose books *The Mechanistic Conception of Life* and *Dynamic of Living Matter* had so much influence on the men of that day, lived not far away. Woods Hole was just the place for a man of Mathews' broad interests, and the group benefited immensely from his new and stimulating ideas. He was a member of the board of trustees of the laboratory from 1906 until his death.

Mathews' textbooks illustrate his love of exposition, and it is as a teacher and a stimulator of young minds that he will be best remembered. His students all think of him with very deep and real affection, grateful for his advice in scientific matters and the encouragement he gave them to adopt careers in medicine and science. It was not only in professional but also in personal matters that Mathews and his wife were so helpful and sympathetic. Up to the time of his death he followed the later life of his students with the greatest interest. A total of 66 master of science degrees and 44 doctor of philosophy degrees were granted under his direction.

At the time of his death, Professor and Mrs. Mathews had been married for 62 years. She was devoted to him, and the family life was a particularly happy one. Mathews was a fine specimen of mankind—tall and handsome, with that athletic look that befits a person of character and determination. I can still see him, walking briskly with great strides along the streets of Woods Hole, with his head held high and a keen penetrating look in his blue eyes, as if he were about to lay bare the secrets of the universe. His convictions were strong and his ideals high. Science, particularly biochemistry, has lost a great teacher and a dedicated seeker of new knowledge.

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News of Science

Improving High School Education

At a meeting of high school principals and teachers in Washington on 23 March, three of the nation's leading scientists and educators offered suggestions for improving high school education. The meeting was part of the fiftieth anniversary celebration of St. Alban's School for Boys at the Washington Protestant Episcopal Cathedral.

Merle A. Tuve of the Carnegie Institution of Washington, James R. Killian, Jr., President Eisenhower's Special Assistant for Science and Technology, and Rear Admiral Hyman G. Rickover of the Navy's nuclear reactor program agreed on the need to raise the standards that all high school graduates must meet. Following are excerpts from the three speeches; the excerpts set forth some of the principal suggestions offered.

Tuve advises making teaching more attractive. "It is exceedingly difficult nowadays to attract into teaching any student who has completed a good, solid, college major in physics or chemistry or mathematics, because there are so many interesting and attractive jobs elsewhere, with good pay, and also because most states and local communities have laws which require all prospective teachers to have taken many semester hours of educational psychology, practice teaching, and similar subjects.

"If we really want to do something about improving secondary education here is one direct and simple thing that will surely have great effect in strengthening our schools: We can go after our local school boards and our own state legislatures to change the laws which now restrict teacher certification to the products of the courses in education.

"There are two other actions local groups can take in any community which also will help greatly to improve secondary education.

"The idea that our secondary school teachers should be working with students five or six hours a day for five days a week, plus some late afternoons and many evenings on P-T. A. and other school assignments, denies these teachers any status as scholars. A practical action for a community group is to insist that the professional teacher be given some time to himself for his own scholarship. We can hire clerks and stenographers and specialists in education to handle these countless chores and public relations activities.

"The other action relates to salaries; this is important but not as vital as the first two points I have made. There should be provision for much greater spread of salaries, and a significant part of this spread should be for merit in teaching and scholarship, not only for longevity and for credits and more degrees from schools of education."

Killian scores attitude of take-it-easy. "If we are to have better science education, we must have better over-all education and if we are to have better education, we must have a shift in values so that intellectual interests and performance are not played down and socially denigrated. We must cultivate in all of our education a distaste for the take-it-easy and anti-intellectual attitudes and a positive taste for what is excellent in intellect and spirit. . . .

"In the development of our public school system, we have concentrated in recent years on making it universally available and of the greatest help to the