so convenient in working up the synthetic reaction mixtures. It soon developed that a good way to discover how best to isolate a vitamin is first to synthesize it! A small sample (5.3 g) of 3 to 5 per cent. alfalfa concentrate kindly supplied by Dr. Riegel was reduced and put through extraction and precipitation procedures worked out with the synthetic substance, and in a few hours' working time 60 mg of pure vitamin $K_1$ was isolated. This sufficed for analysis, color test, assay, determination of the spectrum and for the preparation and analysis of the crystalline diacetate. In every instance direct comparison of the synthetic and natural substances indicated exact correspondence, and there was no depression in the mixed melting point determination. Finally, 2-ethyl-3-phytyl-1,4-naphthoquinone was synthesized and found devoid of vitamin K activity, an observation which effectively disposed of the only alternate possibility. We were thus in a position on August 25 to state positively that vitamin $K_1$ is identical with our synthetic product and has the structure of 2-methyl-3-phytyl-1,4-naphthoquinone. The structure had been fully established in a program of synthetic research independent of any work on the vitamin itself.

The provisional evidence of Doisy and co-workers pointing to the presence of an ethyl group was found by these investigators to have been in error, and in a communication of August 21 they reported completion of degradative experiments which provided full proof of the structure defined above. They thus announced the structure ahead of us, for we were not able to provide the completing evidence of the mixed melting point determination until a few days later. The St. Louis workers reported a second synthesis, by an alkaline method of condensation, of a product isolated as the hydroquinone diacetate, and on the twenty-fifth they recorded ample evidence of the identity of this derivative with that of vitamin $K_1$.

The elucidation of the structure of the vitamin was one important goal of the chemical investigations; a second was the development of a practical synthesis suitable for the manufacture of the pure vitamin in such quantity as may be required in medical practice. The objective seems to be fully met by the synthesis devised at Harvard, and it may be noted that this first synthesis is the only one which as yet has been demonstrated to afford the pure vitamin as such, rather than as a derivative. Trial batch preparations have been carried out in a commercial laboratory giving in a short working period quantities of vitamin equivalent to as much as 30,000 pounds of dried alfalfa. The synthetic material has been found completely innocuous in toxicity tests and has given excellent results in clinical trials.

The testing of simple quinones for antihemorrhagic activity has been conducted in several laboratories in this country and abroad, and Almquist was the first to discover activity in such a substance (phthiocol). Particularly striking is the discovery of S. Ansbacher and E. Fernholz that methylnaphthoquinone is three or four times as potent in the chick assay as vitamin $K_1$, and it is possible that this available and inexpensive substance may find use in therapy as a substitute for the natural principle. There are reasons for reserving judgment, however, for although the compound apparently is quite safe for administration in small doses and has shown high potency in numerous chick assays it does have a certain toxicity and irritating action on the skin not found in the vitamin, and the results in the early assays were so irregular as to lead three research groups to regard the substance as at most feebly active. The high sensitivity and chemical reactivity of the quinone may present an interfering factor, and if an inexpensive substitute is required it might be preferable to employ a substance more closely related to the vitamin, for example, 2-methyl-3-geranyl-1,4-naphthoquinone. Water-soluble derivatives may ultimately prove of particular value, and a series of hydroquinone esters having this property has been prepared in our laboratory.

Much remains to be learned concerning the origin, functioning and fate of antihemorrhagic compounds. The paradoxical high potency of methylnaphthoquinone may possibly be accounted for on the hypothesis that the administered material becomes reduced and provides one of two components required for a synthesis of vitamin K in the organism paralleling that achieved in the laboratory. Another interesting possibility is that the phthiocol isolated from tubercular bacilli after alkaline hydrolysis was not originally present as such but arose as a degradation product of the antihemorrhagic principle shown by Almquist to be produced by the bacteria. At least it has been proved in our laboratory that vitamin $K_1$ can be converted into phthiocol by gentle treatment with alcoholic alkali.

# OBITUARY

## JONAS BERNARD NATHANSON

ON November 25 death came without warning to Jonas Bernard Nathanson, of the Carnegie Institute of Technology. He collapsed while preparing to attend the theater with his family, and death came shortly after the arrival of the physician. Thus "An able teacher, an accomplished scholar, an earnest seeker after truth, a good and loyal friend is gone from our midst."

Jonas Bernard Nathanson was born on November 5, 1889, in Vilna, Lithuania. He came to this country when quite young and received his early education in

the schools of Toledo, Ohio, where his family resided. He attended Ohio State University and received his A.B. degree in 1912. He then attended the University of Illinois and received his A.M. degree in 1913 and his Ph.D. degree in 1916. He was assistant in physics at the University of Illinois from 1913 to 1916. He was an instructor in physics at the Carnegie Institute of Technology from 1916 to 1919; assistant professor of physics from 1919 to 1930; and associate professor of physics from 1930 until his death.

While at the University of Illinois he became interested in the optical properties of the alkali metals. This interest continued during the remainder of his career, and he contributed many papers in the field, also researches on the ratio of the charge to the mass of the electron interference in metallic films and optical dispersion of metals.

He was a member of Phi Beta Kappa, Sigma Xi, Phi Lambda Upsilon, American Association for the Advancement of Science, American Physical Society, Optical Society of America, Physical Society of Pittsburgh (president, 1929), American Association of Physics Teachers and the Association of Physics Teachers of Western Pennsylvania and Environs.

Dr. Nathanson's interest in research continued to the end. He inspired and assisted many students in numerous investigations. He was invited to talk before many scientific societies on his chosen research. His keen insight, thorough understanding and unselfish interest contributed to his success as a teacher. His clear and accurate presentation created in the student an orderly and thorough method of thinking. "He will long be remembered for his enthusiasm, frankness, sincerity, patience and modesty."

He is survived by his widow, Rose M. Nathanson, and one daughter, Carol E.

CHAS. W. PRINE
CARNEGIE INSTITUTE OF TECHNOLOGY

## IN HONOR OF GEORGE FREDERICK ARPS

IN memory of the late George Frederick Arps, who died a year ago, the educational building of the Ohio State University has been renamed Arps Hall. Dr. Arps joined the faculty of the university as assistant professor in 1910, becoming professor of psychology in 1912. He was known for his work on experimental psychology on attention, visual discrimination and color induction. Dr. J. L. Morrill, vice-president of the university, prepared the following tribute, which has been adopted by the board:

The Board of Trustees learns with deepest sorrow of the death of Dr. George F. Arps, professor of psychology since 1912; Dean of the College of Education, 1920 to 1937; and Dean of the Graduate School since May, 1937.

A teacher with the gift of contagious enthusiasm for learning, a scholar of distinguished training and attainments, an administrator of rare vision and unusual accomplishment, a counselor and companion whose generous comradeship was cherished by his colleagues, Dean Arps exemplified in his life and work the highest ideals of effective and enduring service to the Ohio State University. A distinguished figure in the world of higher education in America, by his own leadership and by the contributions to teaching and research of those whom he encouraged, assisted and inspired, Dean Arps conferred honor and prestige upon the institution which he served with unremitting labor and devotion. In his passing the university suffers irreparable loss.

*Be it therefore resolved,* that the Board of Trustees hereby expresses on behalf of the university its appreciation of a great spirit committed to high service, a character whose memory will remain as a challenge to constructive accomplishments, and

*Be it further resolved,* that in his memory the present Education Building on the campus with which he was so long and conspicuously identified be designated from and after this date as "Arps Hall"; and further that a copy of this resolution be spread upon the minutes of the board and transmitted to the members of the family with the sympathy of the board and of the university.

## RECENT DEATHS

PROFESSOR JACOB E. METZGER, director of the Experiment Station, professor of agronomy and head of the department at the University of Maryland, died on December 25, 1939, at the age of fifty-seven years.

DR. HENRY LESLIE OSBORN, professor of biology and geology and dean emeritus of Hamline University, St. Paul, Minn., died on January 3. He was eighty-two years old.

CHARLES NICOLAS AINSLIE, entomologist in the United States Department of Agriculture, 1906–1930, and collaborator thereafter, died on December 5, 1939, at the age of eighty-three years.

DR. ALMON ERNEST PARKINS, professor of geography at the George Peabody College for Teachers at Nashville, Tenn., died on January 3 at the age of sixty years.

DR. GEORGE CHARLTON MATSON, consulting geologist and an independent oil operator of Tulsa, Okla., formerly geologist of the U. S. Geological Survey, died on January 3 in his sixty-sixth year.

# SCIENTIFIC EVENTS

## THE NEW FEDERAL NUTRITIONS LABORATORY AT CORNELL UNIVERSITY

A COMPREHENSIVE research project on the nutritional values of foodstuffs will be undertaken at Cornell University during the summer.

An appropriation from Bankhead-Jones funds has been made available for three laboratories and greenhouses at the university, in which the U. S. Department of Agriculture will center investigations extending throughout the United States. The second unit of