munity so that, as in herpes and some other diseases, the lesions produced by the virus may reappear.

The relation of viruses to the development of some tumors in animals has roused especial interest in recent years, and various papillomatous and other growths in rabbits have been described as well as extremely virulent and rapidly growing tumors in fowls, all of which can be transmitted to others by inoculation of filtered or otherwise isolated material from such growths. Rous and his associates have also found that the influence of tar rubbed on the skin is very effective in stirring the growth of a more malignant form of epithelial tumor growth after inoculation with the papilloma virus. Further studies of the part played by viruses in the production of tumors will be looked for in the future.

It is the extremely small size of the viruses which seems to offer the greatest difficulty in conceiving of their peculiar and specific activities such as might be more readily accepted in larger organisms. Thus in the case of the bacteriophages which are actually parasites, especially related to certain bacteria as hosts and invading their tiny bodies produce a ferment which causes the liquefaction or lysis of their bodies, setting free the bacteriophage to invade others. The story is a familiar one except that it is all on such a small scale, but the epidemic spread of this disease of the bacteria is like that of the diseases of large animals and seems to support surely the living character of these infinitesimal bacteriophages and their introduction from some source to the liquid medium in which the bacteria were alive, causing their death and destruction.

The intracellular growth of the viruses which makes them insensitive to immunizing antibodies injected later is of great interest. The nature of the inclusion bodies found within the cells in some such diseases has never been thoroughly cleared, but the general idea is that they represent accumulations of the virus. The dependence of viruses upon living cells for their multiplication and growth has led to the idea that they must find or produce within these cells some nutritive substance required by them for their maintenance. Thus in the case of tobacco mosaic there is produced by the infection a quantity of a very heavy molecular protein which is the virus. Stanley has isolated this protein and has even crystallized it, proving by all the methods at his command that these crystals of the heavy protein molecule are not merely contaminated with the virus but that they are in themselves the virulent agent.

The question then arises as to the chemical character of other viruses and as to the nature of the factors required in a protein to give it the power of causing a destructive disease, stirring immunological reactions and perhaps especially its power of reproducing itself and multiplying to such extremes at the expense of its host. We have tacitly assumed all this to be the generally accepted character of a living being, and the problem left is perhaps only as to the chemical limitations of living as contrasted with non-living proteins. If only the chemical structure of proteins were not so infinitely complex it would be interesting to reconstruct this heavy protein synthetically and having reached its precise constitution to see whether it had any virus character although synthesized from pure materials which had never had any contact with tobacco plants. As Stanley says, certain compounds act as hormones, others as enzymes, others on injection stir up an anaphylactic reaction—the transitions to those activities which we regard as characteristic of life are not insuperable.

OBITUARY

ADRIAN JOHN PIETERS

DR. ADRIAN JOHN PIETERS, botanist, agronomist and administrator in the Department of Agriculture for nearly half a century, and world authority on forage and soil-conserving crops, died in Washington April 25 in his seventy-fourth year. Known, in recent years, as the Father of Lespedeza because of his apostolic leadership in making that soil-building legume a major crop in the South, Dr. Pieters had a part in a large number of the more significant contributions of plant science to agriculture during the past forty years. In his position as chief of the Office of Seed and Plant Introduction and Distribution he was one of the small group of able men who, in 1901, founded the Bureau of Plant Industry. Subsequently, as head of the section of Clover Investigations and of the Division of Forage Crops and Diseases, and as member of innumerable committees handling matters of Bureau policy, he had a large share in shaping the destinies of that Bureau and, correlatively, of applied plant science throughout the nation. The personalities, the ideas and the ideals of those who thus "set other minds in straight channels" are worth a moment's thought.

Dr. Pieters came to the science of agronomy when that earthy infant was in swaddling clothes. Its garments were sometimes of poor quality and often did not fit. Following horticulture, it was in the process of developing from an art to something approaching a science. Its devotees, of necessity, were mostly men of the soil who, on a foundation of hard realism, had to build a structure that would command the respect of eruditionists. There were not lacking those who scoffed.

Into this situation, in 1895, came a young graduate of

the University of Michigan, trained in biology but with an omnivorous mind. Among other interests which he had or later cultivated were history, literature, farming, languages, jurisprudence, business, bibliography, theology and medicine, in each of which diverse fields he was to become uncommonly well-informed. Nor did he regard these accomplishments lightly. Learning, to him, was not merely a pastime, still less a soporific. It was a live, keen-edged tool made for use. Thus it became his conscious habit to bring to bear on each daily problem different facets of his mind. It might be a proposed law governing the importation of seeds, ergo he considered it with a wide knowledge of its political, economic, legal, historical and biological implications. Even if the problem were of a kind not usually associated with broad culture, as for example —experimental technique, he could see it often from points of view not available to others. Naturally, he had his deficiencies and these he ruefully acknowledged, often lamenting his lack of interest in mathematics, sports, the fine arts and night clubs. Yet certainly he came close to being an intellectual giant simply from the profundity of his general knowledge.

Knowledge alone would not, however, suffice to make him a counselor of high worth. Perhaps from his Dutch ancestry, perhaps because it was an innate personal trait, he possessed a judicial attitude of truly extraordinary quality. He would have been an incomparable jurist. Few men could see more objectively. Fewer still could exercise the faculty with such complete indifference to the consequences to themselves. No single instance comes to mind when he compromised a solution because of its effect upon his personal welfare. If his decision affected others adversely, he made numberless concessions, but never to himself. Mental integrity, as personal integrity, was to him the cornerstone of character, and his scorn of devious thinking, as of devious intent, was quiet but complete.

Thus there was brought to agronomy at a time when it needed dignity, poise and learning a man who personified those attributes. He helped to give the neophyte science distinction, and lived, fortunately, far into its consummation.

Dr. Pieters' cultural contribution to agronomy was incidental, and probably unconscious. His real contribution was to the economic betterment of American farmers. Following a successful organization of what later became the Department and Congressional seed and plant distribution services, he resigned, in 1906, to organize a seed-producing business in California. Four years later he sold the business at a profit and, after a year at Heidelberg, returned to the University of Michigan for his doctorate. At the request of the late C. V. Piper he reentered the Department in 1915 to study the causes of wide-spread failure of the clover crop. Within a few years he had determined that the chief cause of failure was unadapted seed, and he was instrumental in causing restrictions to be placed on the importation of unsuitable kinds. Later he turned his attention to the problem of finding legumes suited to growing on the impoverished acid soils of the South. This led to one of the dramatic finds for which the Bureau of Plant Industry is known. In a small packet of seed laid aside some time before, he found a new kind of Lespedeza from Korea which, when planted at Arlington Farm, developed such superior qualities that it became, in seventeen years, the basis of a Lespedeza industry rivaling that of clover and alfalfa combined.

He retired, at the compulsory age limit, in 1936, but was accorded the unusual distinction of two presidential extensions of appointment in order that the Bureau of Plant Industry and the Soil Conservation Service might utilize his knowledge.

Dr. Pieters was a fluent but precise writer, and his publications, which number more than eighty titles, are a true cross-section of forage crops, green manuring, and seed production. His unpublished counsels, his delightful wit, his unfailing tolerance, his devotion to truth, his unflagging energy, and his fine, inborn courtesy are in the Department's archive of memories.

L. W. KEPHART

U. S. DEPARTMENT OF AGRICULTURE

DR. ERKKI MIKKOLA

ON February 13, 1940, Dr. Erkki Mikael Mikkola, geologist of the Geological Survey of Finland, was killed at Taipale in the defense of his country against invasion. Although only 36 years of age, he had become a leader in the study of Pre-Cambrian problems. His published contributions to the understanding of the complex crystalline rocks of Finland are of fundamental value.

Erkki Mikkola's death is a genuine loss to science. His death is also a human example, for it came on the battlefield in a heroic attempt to protect his people from the invader. Finally, his death is a national symbol, for it represents the bravery and courage of a people who love their independence and their free institutions so much that they willingly give their lives for them.

On January 29, during the time of the fierce and unremitting attacks at Taipale, Dr. Mikkola wrote a letter to his wife, in which he spoke of his hopes for their two-year-old only son, Tapani. It expresses so well the desperate desire of the Finnish people for freedom to pursue their cherished culture that I quote from it, through a translation made by Dr. Pentti Eskola, internationally known petrologist and, with the writer, a warm friend and admirer of Mikkola:

I have just been intensely imagining in my mind Tapani's undertakings and progress of speech, about which you wrote me so much, and I have recollected, among other things, how he almost filled a box with heavy