will serve to perpetuate the four hundred and fiftieth anniversary of the birth of the great author, Nicolaus Copernicus.

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FLUORIDES VERSUS FLUOSILICATES AS INSECTICIDES

UNDER the above caption, Mr. R. C. Roark made reference to certain preliminary contributions[1] by the writer relative to the insecticidal value of fluosilicates in the control of the bean beetle and other insects. Mr. Roark first made the point that "there is nothing new in the use of sodium fluosilicate as an insecticide. Its use for that purpose was described nearly thirty years ago by Higbee (English Patent No. 8236, May 23, 1896)." He then advanced chemical equations to demonstrate the contention that the fluosilicates would break down into fluorides in an aqueous system.

From the foregoing statement, one would infer that Mr. Roark was under the impression that the writer had claimed to have discovered the insecticidal properties of sodium fluosilicate.

The writer did not make such a claim, nor did he intend to convey this impression in any of the three articles[1] cited by Roark. Neither was it intended so to do in bulletin 131, of the University of Tennessee Agricultural Experiment Station, which reported experimental results from a number of fluorine compounds, including sodium fluosilicate, cryolite, calcium fluosilicate, calcium fluoride and certain combinations not in general usage. This, our first contribution, was not cited by Mr. Roark and probably had not been seen by him.

From the inception of the experiments, attention was focused on the element *fluorine,* because of its known efficiency in the control of certain pests. After investigation as to methods of manufacture of the fluorides the thought came that the cheaper, raw product, sodium fluosilicate (Na_2SiF_6), might prove of value. Diligent search of the *scientific* literature failed to disclose a report on the use of this material as a protective agent for plants. Later, however, an obscure British patent of nearly thirty years' standing was brought to our attention. This patent was primarily intended to cover the use of *solutions* in outdoor practice. In our investigations, which were carried out without the benefit of knowledge concerning Higbee's patent, and with special reference to the control of the bean beetle, we adopted the idea of dilution by a solid carrier to minimize or eliminate plant injury. In so far as we have been able to ascertain, this constitutes the first scientifically planned experiment with the fluosilicates for the control of the bean beetle by dusting.

In substance, our reports have been based upon findings obtained by practical field tests and under scientific control. No attempt was made to explain the chemistry responsible for the lethal effect produced in the field. On the other hand, the contribution by Mr. Roark embodies, in the main, a hypothetical discussion of the chemical factors involved, with promise of a report upon tests made to establish the insecticidal value of certain related fluoride products of minimum solubility.

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[1] *Ind. Eng. Chem.*, 16, 1249, 1924; SCIENCE, 61, 22, 1925; *Jour. Econ. Entomology,* 18, 122, 1925.

COMMENTS ON "VACUOLES"

THE article on "The Origin of Vacuoles" in the issue of SCIENCE for April 30 awakens interesting associations. About 1849,[1] Carl Nageli described certain plasmic structures of plant cells, which he named "Utricles" and which included plasmic vacuoles. Unaware at the time of the observations by Nageli, the writer in 1915[2] made a study of certain plant cell inclusions, which were described under the name "sphaerocytes," and which included in part the Utricles of Nageli, the "Zellenreste" of various authors and the "Vacuoles" of Lloyd and Scarth. An article on vacuoles appeared about 1897, but thus far the writer has not been able to find the reference again, although his memory suggests the Berichte der deutschen botanischen Gesellschaft. Vacuolization of cell plasm is well known. Chlorophyll grains frequently become vacuolized, as in beet blight. Vacuolization should, however, not be confused with plasmic vacuoles nor with the sphaerocytes mentioned. Certain sphaerocytes, notably the nucleosphaerocytes, possess a remarkable vitality, having been kept alive in hanging drops for over eighteen months, showing marked growth and also nuclear increase (not septation of the sphaerocytes, however). It is much to be regretted that these structures have not received the attention of researchers in biology and botany.

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[1] "On the Utricular Structure of the Contents of Cells," Reports and Papers, Botany, Ray Society, London, 1849.

[2] "Die Blasenzellen (Sphaerocyten) der Pflanzen und ihre Bedeutung zur Erklärung Neoplasmischer Bildungen." *Deutsch-Amerikanische Apotheker-Zeitung,* November, 1915; "The Sphaerocytes of Plants and Their Possible Significance in Plant Growth and in Neoplasmic Formations," *Pacific Pharmacist,* November, 1915.