chants and other persons offer substantial prizes to those killing the greatest numbers of the animals on the "vermin" list.

In the Biennial Report of the Conservation Commission of West Virginia for 1933–35, a list of "vermin" killed in the fiscal year 1933–34 was published (see Table I). Only 26 counties held contests during this year.

TABLE I

1933–34	Pieces of Vermin
Hawks	3,007
Hunting house cats	1,892
Snakes	79,481
Water dogs	13,497
Crows	9,438
Weasels	1,430
Grey fox	1,451
Turtles	15,370
Kingfishers	1,030
Rats and mice	34,475
Garfish	87
Terrapins	4,417
Mink	321
German carp	59
Red squirrels	399
Chipmunks	18,089
Owls	954
Starlings	3,985
Wild cats	311
Timber wolf	1
English sparrow	1,907
Total	191,511

The report continues:

> During the fiscal year 1934–35 forty counties have sponsored and conducted vermin control contests. This is an increase of fourteen contests over the previous year.
>
> While the actual results are not available at this time, information in our possession, based on partial reports, indicate the results will greatly exceed the previous year's showing. A conservative estimate will show a grand total of three hundred thousand predatory animals, birds and snakes disposed of by these beneficial contests.

If 300,000 animals are destroyed in a single season in a small state like West Virginia, what would be the total for the entire country if these "beneficial" campaigns were held everywhere?

Of course there are several animals of this list that might well be exterminated, but there are more which are not only of general interest but are of actual benefit to man.

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REPORTS

RESEARCH PROGRAM OF THE ILLINOIS STATE GEOLOGICAL SURVEY

THE biennial appropriation for the Illinois State Geological Survey for 1935–36, as recently made by the State Legislature and approved by Governor Henry Horner, is $312,750. This total is the same as the appropriation for the last biennium, except that the governor permitted the item for contingency, which amounted to $30,000, to be redistributed among the standard items of the appropriation in order to permit better planning in the use of the funds.

The scope of the survey's current research program extends from the raw materials as they occur in the ground to industrial research on utilization and marketing. Projects already under way cover most of the state's minerals, including coal, oil and gas, clays and clay products, woolrocks, silica, fluorspar, sand and gravel, and other useful or potentially useful mineral substances.

Coal: Studies in coal include: completing the outlining of areas of strippable coal; laboratory studies in gas, coke and by-product making properties of coal; conversion of slack coal into smokeless briquets; study of electrical resistivity method as applied to exploration for shallow coal beds; and study of the physical, chemical and botanical constitution of Illinois coals and of the separability of their banded ingredients with reference to the possibility of finding improved and new uses.

Oil and Gas: Studies in oil and gas will center about geological exploration for new areas structurally and stratigraphically favorable to oil and gas accumulation, and improved methods of oil recovery, particularly water-flooding. Reports are in progress on the western Lawrence County oil field and on the protection of oil-well casing from corrosion. Special studies of drill cores of oil sands with reference to porosity, permeability, saturation and estimation of reserves will be made.

Clay and Clay Products: An investigation is being made of Illinois face brick and the possibility of using Illinois peat mixed with clay in the manufacture of light-weight structural and refractory products. Exhaustive research is being made, by means of petrography, the x-ray and chemistry, into the mineralogical constitution of Illinois clays, with a view to discovering the control that is exercised by the mineral constituents and their texture upon the products, how these products may be improved and new ones made.

Silica: Laboratory studies are investigating the use of ganister and novaculite from southern Illinois as raw materials for silica refractories.

Rock Wool Resources: The discovery of deposits of rock and the determination of the range of chemical compositions suitable for the manufacture of rock wool, as announced in a detailed bulletin last fall, has resulted in the creation of a new and promising in-

dustry in Illinois. Assistance is now being rendered to those who are engaged in or who are contemplating the development of the rock wool resources of the state.

Rock and Rock Products: A detailed study of the physical and chemical character of the limestones and dolomites of Illinois is being made along lines helpful to their uses in the construction, metallurgical, chemical and agricultural industries.

Fluorspar: The electrical resistivity method, supplemented by stratigraphic and structural studies, is being employed cooperatively with the U. S. Geological Survey in exploration for additional reserves of fluorspar in Hardin County. Laboratory studies are investigating the chemical properties of fluorine and the possibilities for its use in the manufacture of products having special properties, on account of the fluorine, that will make them widely useful.

Other Studies: Additional studies include: sand and gravel resources for farm-to-market roads; the completion of reports on intensive areal and economic geology studies of the Chicago region and other industrial areas; geological assistance in ground-water development; geological studies of highway engineering problems; economic analysis of the competitive position of Illinois coals in the Illinois coal market area; cooperation with the Geographic Society of Chicago in the preparation of a comprehensive geographic atlas of Illinois; and continuation of educational extension work.

This represents the normal research program of the Illinois Geological Survey. To maintain such a program and to meet the increasing call for information from industries, state departments and the citizens of the state, the staff is organized into: (1) a geological resource section with divisions in coal, oil and gas, non-fuels, areal and engineering geology, stratigraphy and paleontology, subsurface studies, petrography and physics; (2) a geochemistry section with divisions in fuels, non-fuels and analytical work; (3) a mineral economics section; (4) a topographic mapping section (in cooperation with the U. S. Geological Survey); and (5) a publications and records section. The survey's full-time technical staff numbers thirty-four; non-technical and clerical, eleven. The part-time staff, which reaches a maximum during the summer field season, ranges up to twenty-five.

M. M. LEIGHTON,
Chief

SPECIAL ARTICLES

NATURE OF CRYSTALS FOUND IN AMOEBA

THE crystalline inclusions of Protozoa, in particular Amoeba, have long been objects of study. A comprehensive review of the older literature is given by Schubotz.[1] From Schubotz's work to the present, little work has been done upon the nature and rôle of the crystals of Amoeba. These crystals have been held by various workers to be composed of calcium oxalate, calcium carbonate, leucin, calcium urate, calcium phosphate and a double salt of sodium and potassium phosphate. In structure the crystals have been described as octahedral, as doubly pyramidal, as many-sided bipyramids and as rhombic plates. Schubotz describes them as having "in most cases, the form of many-sided bipyramids with shortened poles or rhombic plates." He observes that they are doubly refractive, that they are colorless and range in size from 2 to 5 microns, and that they appear to lie directly in the plasma.

Our interest in the nature of these crystals arises from the fact that at certain times amoebae in culture are quite clear and have relatively few crystals, while as the culture grows older and the pH of the milieu rises toward neutrality, the crystals become very numerous, the water content of the organism apparently decreases markedly, and the amoebae become opaque to transmitted light. We undertook the determination of the chemical identity of the crystals in the hope that thereby we could understand their rôle in the metabolism of the organism.

The most prominent crystalline inclusions of Amoeba are tabular and six-sided and most probably belong to the orthorhombic system. There is a slight possibility that they belong to the tetragonal system. Their average size is approximately 2.5 microns in length, the range being from 0.5 to 3.5 microns. The corner angles of these polygons measure, on an average, 112°, and the lateral angles 142°, a total of 720° as against 732° for a regular six-sided polygon. Closer agreement could not be obtained because of the smallness of the crystals, and the fact that Becke lines obscure the exact outline of the crystal under the high magnification required. The crystals are doubly refractive. No interference figures were obtained upon study with the petrographical microscope. The crystals are colorless, although they appear to be yellow when viewed immersed in oil.

The index of refraction, as determined by the Becke method, using a mixture of methyl iodide and a-monobromnaphthalene, is 1.668. The refractive index of the liquid was determined in a standard sodium light (Na_D 589). The smallness of the crystals made a study of their Miller indices impossible.

The melting point is somewhere in the region of 290° C. This was determined approximately by

[1] H. Schubotz, *Arch. f. Protistenkunde*, 6: 1–46, 1905.