land 57¾, Italy 10½, Russia 4⅓, Sweden 46⅓, Switzerland 82½, the United States 11½. In this list Switzerland is highest, with 82½ scientists per million of population. Holland is second; Germany third; the United States is eighth, with only two of the ten countries below her. In proportion to the population, Switzerland had over seven times more scientists than the United States, Holland had five times more, Germany over four times more, and Sweden four times more. This statistical study gives forceful answer to the question regarding the need of organizations like the Sigma Xi, 38 years ago, in the United States.

FLORIAN CAJORI
UNIVERSITY OF CALIFORNIA

ENLARGED PARATHYROIDS IN RACHITIC CHICKENS

IN truly rachitic chickens, enlargement of the parathyroid glands occurs with remarkable constancy. Similar enlargement of the parathyroids of rachitic mammals—particularly rats and the human—has been reported by several investigators, such as Erdheim, Ritter and Pappenheimer and Minor.

This enlargement of the parathyroids in rachitic chickens is a very useful means for differentiating between rickets and various other morbid conditions that occur in birds used in nutrition investigations. For instance, in the pathologic condition commonly known as "legweakness," it frequently becomes necessary to differentiate between rickets and some other condition that may give rise to leg symptoms in chickens.

The ease with which the chickens' parathyroids may be found and their remarkable responsiveness to the rachitic process make them a valuable criterion for judging the presence or absence of rickets.

L. P. DOYLE
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION

FALL OF A METEORITE IN BRITISH COLUMBIA

A METEORITE was heard and seen to fall, and the incandescent pieces were seen to splash from the top of the mountain on the north side of the water supply creek of Manitou cannery, on the west side of Dean channel, British Columbia, between nine and eleven o'clock in the evening of August 3. This place is about opposite the mouth of Dean River. It was both heard and seen by Mrs. Harlan I. Smith, of Ottawa, Ontario, Mr. Milo Fougner, of Bella Coola, B. C., Mr. Andrew Widsten, Dominion Fishery Patrol officer, of Bella Coola, B. C., and Mrs. Humphrey, wife of the cannery caretaker. Mr. Smith and Mr. Humphrey heard but did not see it. Some passengers on the steamship *Camosun,* of the Union Steamship Line of Vancouver, then at the cannery wharf, also possibly saw or heard this meteorite. The sound was heard almost simultaneously with the sight.

HARLAN I. SMITH
THE NATIONAL MUSEUM OF CANADA,
OTTAWA, CANADA

SPECIAL ARTICLES

ON THE UPPER CRITICAL CONCENTRATION OF OXYGEN IN ROOT GROWTH

THE writer has shown that in event of a deficiency of oxygen in the atmosphere of the soil the rate of root growth varies inversely with change of temperature[1] and that the "minimum" oxygen supply is not a fixed supply but that it also varies, but directly, with temperature change.[2] Such concentration has been termed the lower critical concentration.[3] The lower critical concentration of oxygen is thus the least concentration at which growth will take place at any temperature.

In considering the relation of root growth to available oxygen it will be apparent that there are four cardinal concentrations. Of these, one, the lower critical, has already been defined. Another concentration is that at which growth is "normal." This is termed the upper critical concentration. Between the lower and the upper critical concentration exists an oxygen deficiency, as will be seen. But above the upper critical concentration an increase in the amount of oxygen does not apparently induce change in the growth rate until a certain and possibly high concentration is reached, when the rate may fall. And, finally, the concentration may apparently be so great as to bring about entire cessation of growth. Such would be the maximum concentration. Of the upper optimal concentration, the range of the optimal or of the maximal concentration or the range of the supraoptimal, this note has nothing to do. Attention, however, should be called to certain apparent characteristics of the upper critical concentration of oxygen in root growth.

The upper critical concentration of oxygen, as above defined, is such partial pressure as will just permit a "normal" rate of root growth at any given temperature. For the reason that the oxygen requirement of roots varies with temperature changes, the actual concentration for the upper critical is greatest at the highest temperatures and least at the lowest temperatures. A test of what the upper critical con-

[1] "The influence of the temperature of the soil on the relation of roots to oxygen," W. A. Cannon, SCIENCE, n.s., 58: 331, 1923.

[2] "A note on the relation of root growth in the soil to the oxygen supply: The growth ratio," W. A. Cannon, *Ecology,* 5: 319, 1924.

[3] In a study on roots and aeration, unpublished.