when placed under vacuo, soils released considerable gas, consisting mainly of carbon dioxide with some nitrogen and almost devoid of oxygen. This gas was believed to be held by the soil "dissolved in the surface films of water and other substances." On the other hand, the first portion of gas thus removed contained in several instances nearly as much nitrogen as atmospheric air, hence it seems doubtful that it was present in dissolved form. Instead, it probably came from the smaller pores and more poorly ventilated portions of the soil. Thus, although "free air" samples taken at 6″ depth on an area known as the "Broadbalk wilderness" contained generally less than 0.8 per cent. CO_2 and more than 19.6 per cent. O_2, the first 30 cc of gas removed under vacuo from 400 grams of the same soil contained 19.3 per cent. CO_2 and only 5.5 per cent. O_2, along with 75.2 per cent. N_2. It would appear that much more refined techniques, possibly of a "micro" character, will need to be developed before the actual conditions at the immediate surface of the growing roots will be known.

Root Respiration and Mineral Nutrition

The vital role of root respiration in the physiology of the plant is emphasized by recent work of Hoagland and Broyer,[30] who showed that salt intake by roots tends to vary directly with the intensity of root respiration. Previous work by other investigators had strongly indicated that such a relation between respiration and electrolyte accumulation applies generally to living plant cells. For example, Steward[31] found that it applied to potato tuber tissue and voiced the opinion that respiration "supplies the energy necessary for salt absorption against a concentration gradient as well as the maintenance of existing concentrations of solutes in the vacuole much greater than in the surrounding medium," also that "other variables being adequately controlled, any treatment which either decreases or increases the total respiration . . . causes a corresponding decrease or increase in the total salt absorbed." Not only may respiration supply the energy required to move electrolytes from the normally low concentrations in the soil solution to the relatively high concentrations in the root cells, but also, considered from the viewpoint of Jenny and Overstreet's[32] theory of "contact nutrition," respiration also supplies the H^+ and HCO_3^- ions which the root exchanges for cations and anions on the surface of soil colloids.

Summary

(1) It becomes increasingly evident that continued root growth with the establishment of new root-soil contacts is necessary for the normal entrance of both water and mineral nutrients into the root. This concept emphasizes the ecological importance of factors tending either to impede or favor the spread and permeation of roots in the soil.

(2) The characteristics of soils with respect to (1) available water capacity, (2) permeability to water and (3) permeability to air are largely determined by the volume and size distribution of the soil pore space. The latter is conveniently characterized by measuring the water held by a soil at varying moisture tensions.

(3) In recognition of the foregoing, it may be concluded that a better understanding of root-soil relationships should result from more general application of interpretative studies of soil pore space conditions to root development, and from the development and application of micro-methods for studying the conditions, both physical and chemical, existing at the actual root soil interface.

SCIENTIFIC EVENTS

MATHEMATICAL SYMPOSIUM AT THE UNIVERSITY OF NOTRE DAME

A symposium on the Foundations of Topology was held at the University of Notre Dame on April 10 and 11.

In the classical topology, the concept of space was introduced as a set of points for which certain relations are defined which distinguish the space from an abstract set, *e.g.*, it was assumed that a limit concept has been defined in the space or that neighborhoods of points are given. A recent trend of topology seems to lead away from this set theoretical foundation, and points in the direction of a foundation on relations between the subsets of the space rather than between the points. The points, in this new approach, are introduced only later as certain sequences or systems of subsets of the space.

At the first of the three meetings of the symposium, conducted by Professor S. Lefschetz, of Princeton University, Professor R. L. Moore, of the University of Texas, spoke on "Contiguous Points," a theory somewhat intermediate between the set theoretical foundation and a theory of lumps. Professor Karl Menger, of the University of Notre Dame, developed a theory in which points are defined as certain nested sequences of lumps, a procedure similar to that of physics.

At the morning meeting on Thursday, Professor

29 E. J. Russell and A. Appleyard, *Jour. Agr. Sci.*, 7: 1–48, 1915.

30 D. R. Hoagland and T. C. Broyer, *Plant Physiol.*, 11: 471–507, 1936.

31 F. C. Steward, *Protoplasma*, 17: 436–453, 1932.

32 H. Jenny and R. Overstreet, *Soil Sci.*, 47: 257–273, 1939.

E. W. Chittenden, of the University of Iowa, spoke about the "Classification of Topological Functions," connecting the foundations of topology with the so-called lattice theory. Dr. John W. Tukey, of Princeton University, spoke about "The Equal Generality of 'Convergence,' 'Closure' and 'Neighborhoods,'" pointing out the equivalence of the three classical foundations of topology, provided that they are taken in a sufficiently general sense. Dr. A. N. Milgram, of the University of Notre Dame, presented a paper, entitled, "Partially Ordered Sets and Topology," in which he succeeded in deriving important parts of classical topology for general partially ordered sets without any assumption about the existence of points. Professor G. B. Price, of the University of Kansas, conducted a discussion.

In the afternoon meeting on Thursday, conducted by Professor W. L. Ayres, of the University of Michigan, Professor S. Lefschetz spoke on "The Foundations of Algebraic Topology." This theory, started by Poincaré, is of an entirely combinational character. Dr. Henry Wallman, of the Institute for Advanced Study, spoke on "Lattices and Connectivity," first presenting some recent ideas of J. W. Alexander and then his own introduction of topological spaces on the basis of the theory of lattices which he developed in continuation of the work of M. H. Stone.

The meeting was attended by a group of more than forty visitors.

KARL MENGER

CENTENNIAL CELEBRATION OF THE FOUNDING OF THE DEPARTMENT OF CHEMISTRY OF WESTERN RESERVE UNIVERSITY

WESTERN RESERVE COLLEGE was founded at Hudson, Ohio, in 1826, and in the early years chemistry was taught only as a part of other courses. It was not until the college year 1839–40 that a professor began service who taught a course wholly devoted to chemistry. This course was given for one term of the senior year.

The centenary of this event has just been celebrated at the university in Cleveland on Open House Day, April 12. In 1882 the college moved to Cleveland, and at the same time its name was changed to Western Reserve University. Samuel St. John was appointed by the trustees as professor of chemistry, mineralogy and geology and took up his duties in the fall of 1839. He was a graduate of Yale College of the class of 1834. After graduation he remained in New Haven for two years, studying law, and was admitted to the bar in 1836. During the year 1836–7 he was tutor of Latin at Yale and besides took some lectures in medicine, receiving the degree of A.M. in 1837. He then spent a year in Europe, attending lectures on natural history and medicine in London and Paris. The year 1838–39 he was at Columbia University studying with John Torrey, professor of botany and chemistry. While teaching at Western Reserve he received the honorary degree of M.D. from the Vermont Medical College and that of LL.D. from Georgetown College, Kentucky. He resigned his position in the arts college of Western Reserve in 1852, but continued to teach in its Medical School until 1856. In 1858 he succeeded Torrey in the Medical School of Columbia University and died in 1876.

For the next five years chemistry was taught by various instructors, and in 1857 J. Lang Cassels, M.D., who had been teaching in the Western Reserve Medical School, took over the course in chemistry in the arts college. Dr. Cassels was a native of Edinburgh, but had taken his medical degree in New York State. He continued to teach chemistry in the college until 1869, when Edward W. Morley, A.B., Williams, 1860, was appointed Hurlbut professor of natural history and chemistry. Up to this time chemistry had been taught wholly by means of lecture demonstrations and recitations. In 1870, however, under Professor Morley's direction a laboratory room was fitted up for students, and in the words of the catalogue from this time on "students performed under the guidance of the professor all of those experiments which were suitable for them, while those that demanded more experience were performed for the class at the table of the teacher."

After the college was moved to Cleveland additional courses were offered, and in 1892, H. P. Cushing, professor of geology and mineralogy, took over the teaching of qualitative analysis. In 1895, a full-time instructor was added in the person of Dr. Hippolyte Gruener, and in order to give Professor Morley more time to devote to research Dr. O. F. Tower joined the department in 1898. In 1906 Professor Morley[1] retired, and in 1910 a new chemical laboratory was erected and named the Morley Chemical Laboratory. In the meantime Professor Morley had been succeeded by Dr. Tower as Hurlbut professor of chemistry and by Dr. Gruener as professor in the College for Women. Since then the department has grown rapidly, and now, taking into account the department of biochemistry in the Medical School and of pharmaceutical chemistry in the School of Pharmacy, there are twenty-three professors, instructors and lecturers together with many assistants giving eighty-six courses in chemistry in the university.

In celebration of this one hundredth anniversary many of the stores of Cleveland kindly loaned some of their display windows for exhibits arranged by members of the chemical department illustrating various phases in the industrial application of chemistry.

[1] For an obituary of Professor Morley, see SCIENCE, 57: 431.