on the twenty-seventh Annual Chemical Engineering (Eastern) Inspection Trip under the direction of Dr. James R. Withrow, chairman of the department, and Assistant Professor Joseph H. Koffolt. They planned to visit plants in Rittman, Barberton, Akron, Cleveland, Niagara Falls, N. Y., Rochester, New York City, Grasselli, New Jersey, Wilmington, Delaware, Baltimore, Maryland, and Pittsburgh, Pennsylvania. The industries visited included the paper board industry, rubber industry, chemical stoneware, dirigible fabrication, paints, varnishes, insulators, high tension problems, manufacture of tungsten filaments, glass bulb blowing, hydroelectric power development, carborundum, petroleum refining, heavy chemical manufacture, manufacture of graphite, rayon, electrolytic caustic soda, chlorine, glass-lined equipment, silver salts, photographic films, sugar refining, dyes, chemicals and intermediates, industrial alcohol, alcohol chemicals, the U. S. Bureau of Mines, Pittsburgh, and the Fuel Testing Laboratory of the Carnegie Institute of Technology, Pittsburgh.

GIFTS to the National Research Council since last October include three new appropriations from the Rockefeller Foundation: (*a*) A fund of $50,000 for the continuation of the general research aid fund which has been administered by the council since 1929, making a total of $320,000 provided by the foundation for this purpose. (*b*) A fund of $75,000 for the support of the program of research in problems of sex which has been directed by the council since 1922, with the aid of grants from the foundation now amounting to $735,000. (*c*) A further appropriation of $75,000 has been made by the foundation to *Biological Abstracts* for the expense of the editorial work of this journal. This fund will be administered through the National Research Council. Altogether a total of $793,000 has been provided by the foundation toward the support of the *Abstracts* since the establishment of the journal, which began publication in 1926. The firm of E. R. Squibb and Sons has given the sum of $1,400 for the support of two fellows working in cooperation with the Committee on Drug Addiction, one with the group engaged upon chemical investigations for the committee at the University of Virginia, and one with the group at the University of Michigan, which has charge of the physiological investigations of the committee.

THE late Dr. Alexander S. Monro, Vancouver, B. C., former president of the Canadian Medical Association, who died on August 12, 1932, bequeathed to the University of British Columbia a fund of $80,000 for medical research. The bequest will become available after the death of all beneficiaries of the will.

ACCORDING to the London *Times*, an official decree issued by the commissarial burgomaster of Munich, Herr Fiehler, restricts all Jewish doctors in the Munich municipal hospitals (including most of the university institutions) to Jewish bodies in their dissection work, and bans all Jewish medical students from these hospitals.

THE transmission of weather maps by teletype, over a mileage of airways which already amounts to about 13,000 miles, is a new feature introduced in the weather service in the United States through a cooperative arrangement made between the Weather Bureau of this department and the Department of Commerce. Such transmission is a valuable improvement in the efficiency of weather service for air traffic of all kinds, says the Weather Bureau. For the purpose of the teletype distributing system the country is divided into three regions, for which Cleveland, Kansas City and Oakland, Calif., serve as distributing centers. At these centers Weather Bureau personnel prepare base weather maps every four hours for the respective regions. These base maps are then given to teletype operators of the Department of Commerce, who place them in a teletypewriter and type on them symbols representing ceiling, visibility, lines of equal barometric pressure, etc. The maps are sent over a number of electric circuits simultaneously by use of an automatic perforator and perforated tape. With the use of the perforated tape the map is duplicated at all teletype-equipped points in the circuits. After a map has been transmitted to the circuits in its own region it is then relayed to circuits in other regions.

DISCUSSION

DESTRUCTION OF MOORING ROPES BY TEREDO; GROWTH AND HABITS IN AN UNUSUAL ENVIRONMENT

IN the summer and autumn of 1930 a species of *Teredo* appeared in Long Island Sound in unprecedented numbers. Instead of confining their borings exclusively to piles and other submerged pieces of wood, as is usually the case, the young mollusks also attacked the ropes which held buoys and mooring floats at anchor. In a number of cases the ropes were entirely severed and the boats set adrift. The greatest damage seems to have occurred in New Haven Harbor, but similar trouble was reported from near New York. Mr. Raymond E. Miskelly, of the Plymouth Cordage Company, who first called my attention to this attack on rope, informs me that injuries of this nature were more or less general along the coast south of Cape Cod, as well as in Long Island Sound, during the same months.

The species responsible for this aberrant behavior

was identified by Dr. Paul Bartsch as *T. morsei* Bartsch,[1] which is always found in submerged timbers in these localities and which has been usually considered merely a local variety of the widely distributed *T. navalis* Linn. Although all the individuals in the ropes were young, the variations in structure of shell and shape of pallets fall within the limits found by Miller[2] to occur in *T. navalis* under various environmental conditions.

Only ropes that had been continuously submerged for several weeks were seriously damaged and these mainly at the lower ends near the attachments to the anchors, corresponding with the usual preference of teredos for wood placed within about a meter above the surface of the mud.[3,4] In the rope, however, the damage usually extends for two meters or more, due to the slack which falls to the bottom at low tide.

The habits of the young mollusks in the rope are somewhat different from those of other individuals when boring in wood. The fibers of the rope are all twisted into close spirals in the yarns of which the rope is composed and the yarns are again twisted spirally into the cords which are themselves twisted into the finished rope. The *Teredo* in boring tends to penetrate at right angles to the surface, but, due to the twist of the fibers, the tunnel actually cuts obliquely across the yarn. The diameter of the yarn is frequently between 2 and 4 mm and as soon as the tunnel approximates this diameter the yarn is completely severed. The individual fibers of the rope are thus cut into bits, ranging from a few millimeters to a few inches in length, according to the distance between adjacent borings. When the borings are close together the affected portion of the rope falls into shreds. The parting of the fibers leads to the death of all the borers, which drop out into the water.

It has been observed[3] that the *Teredo* seldom passes from one piece of wood to another closely applied, but in the rope many of the tunnels lead from one yarn to the next.

The young mollusks had evidently found the ropes less suitable than wood for normal growth, for many of them were approaching sexual maturity when only 10 to 12 mm in length. In wood the size at sexual maturity may reach 40 to 50 mm if conditions are favorable; otherwise growth may be retarded while the development of sexual products continues, but more slowly than in individuals growing in a more favorable environment.

Examination of the gonads of many of these young teredos shows that in this unusual situation there is a strong tendency toward protandric bisexuality. In approximately half the sexually differentiated individuals studied the gonads consisted of a cortical layer of yolk-forming ovocytes, with spermatogenic cells filling the lumen of each follicle. There was a fairly close correlation between the size of the ovocytes and the abundance of spermatozoa already formed, indicating a typical protandric condition. In a few individuals most of the spermatozoa had been previously discharged and in these the ova were fully mature. Some evidence of protandry has been reported for another species of the genus.[5]

In addition to the protandric females other individuals were presumably exclusively male, the cells of the cortical layer remaining small and apparently undifferentiated. Others had only a few scattered ovocytes in the cortical layer of an otherwise typical spermary. Thus all individuals first function as males, at least in this unusual environment.

The fibers of the rope are devoured and partially digested, as is normally the case with wood,[6] but the animals remain stunted and produce but few gametes as compared with the vast numbers formed by normal individuals.

Even if a certain amount of reproduction does occur by the teredos living in the rope, this material is highly unsuitable for long survival, and the mortality before reaching the reproductive period must be very great. If the borers are numerous the cut fibers of the rope separate or the entire rope parts; in either case the adjacent borers perish by being dropped out into the water.

While the damage reported in 1930 was unusually serious, these are not the only records of teredos boring in rope or in plant structures other than wood. Lobstermen state that they experience trouble of this nature from time to time, as the borers attack not only the wooden trap but the adjacent part of the buoy rope as well. The unprecedented abundance of this mollusk in that year is thought to have resulted from unusually favorable conditions for the survival of the larvae, which float for two to three weeks[3,4] near the surface of the water before settling upon the objects in which they bore and mature. The free-swimming stage is always precarious and most of the larvae die without completing metamorphosis. Their potential numbers are exceedingly large, however, for a single female may produce more than a million larvae in one season.[3,4] The conditions for survival were evidently better in 1930 than in any other recent year and this is true not only for the teredo but for

[1] Paul Bartsch, *Bull. 122, U. S. Nat. Mus.*, 1922.

[2] R. C. Miller, *Univ. Calif. Publ. Zool.*, 22: 292–328; 401–414, 1922–23.

[3] H. B. Grave, *Biol. Bull.*, 55: 260–282, 1928.

[4] C. A. Kofoid and R. C. Miller, *Final Rept. San Francisco Bay Marine Piling Comm.*, 188–343, 1927.

[5] C. M. Yonge, *Quart. Jour. Mic. Sci.*, 70: 391–394, 1926.

[6] C. M. Yonge, *Trans. Roy. Soc. Edinburgh*, 54: 703–718, 1926.

other mollusks, such as the oyster and clams, which have similar free-swimming larvae, for these survived in unusual numbers the same year.

The presence of even a few adult teredos in piling or in other submerged wooden structures may thus lead to a repetition of this unusual behavior whenever the environmental conditions are such as to favor the survival of their innumerable progeny, provided there is not sufficient wood in the areas to which the pelagic larvae are carried by the currents in the water.

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THE EFFECTS OF MEDIA ON BACTERIAL FILTRABILITY

THE fact that Seastone and Lawrence[1] were unable to duplicate Kendall's filtration experiments on the Rawlins strain of *B. typhosus*, even with "K" medium made from "K" powder supplied by him, indicates the probable existence, in this work, of one or more neglected but variable factors. This is further evidenced by the statement of Seastone and Lawrence that their "K" medium showed no uniformity of pH from tube to tube, and also that it occasionally developed a spontaneous turbidity without inoculation.

I query whether bacteriologists, in carrying out filtration experiments, consider or give due weight to the following physico-chemical or colloid factors operative in their media, even when using identical filters; for variations in the filters themselves involve a series of additional factors, based on the specific attractions between filter constituents, bacteria and media constituents:

(1) Colloids may favor the passage of fine particles through filters.
(2) Variation in bacterial deformability may affect filtrability.
(3) The flocculative or deflocculative power of the medium, at the time of filtration, must be considered.

At a symposium on filtration held by the American Society of Bacteriologists at Philadelphia in December, 1926, I heard no reference to factors (1) and (2), and felt constrained to draw attention to them in the open discussion and later on in SCIENCE for February 25, 1927.

Factor (1) was dealt with by R. Zsigmondy ("Colloids and the Uultramicroscope" [1909], Chapter 14 on Filtration Experiments), and the fact that moistening the gut with bile increases its permeability to some products of digestion is known to physiologists. Factor (2) was pointed out by Bechhold and Neuschloss,[2] in connection with work on lecithin emulsions where the individual droplets, several μ in diameter, under a pressure above 150 g./cm^2, passed through an ultrafilter which completely retained hemoglobin, and whose pores were less than 30 mμ in diameter. Bechhold's explanation is that the lecithin passes the filter-pores in filiform fashion, and reforms droplets after its exit.[3] Apart from the stage of growth of the inoculum, and the relative growth-producing quality of the medium for the bacteria, both of which affect bacterial size, it is not impossible that changes in the medium (and pH is only one factor) may affect the *turgidity* of the bacteria present, and therefore their filtrability under constant pressure.

As to factor (3), the protective or coagulative action of any medium is the summation of various factors, including the specific colloids present. Filtration conditions are affected by pH, salts, temperature, cumulative protective relations, etc. There is an extensive literature on the wide variation in the protective action of colloids, especially of albumins, albumoses and their fractions, toward colloidal gold ("gold number"). Some fractions, instead of being protectors, are active coagulators.[4]

On first reading of Kendall's results,[5] it seemed possible that they might, in part, be accounted for by some or all of the factors above stated. Through the kindness of Dr. L. W. Famulener and his staff at the Pathological Laboratory of St. Luke's Hospital (New York), I was able to have made some preliminary tests on the relative protective behavior of three bacterial media, obtained through courtesy of the New York City Board of Health.

On March 24, 1932, samples of beef broth, veal broth and "K" medium were subjected to the "colloidal gold reaction," according to the technique described by Karl M. Vogel.[6]

The results were:

Beef broth	5	5	0	0	0	0	0	0	0	0
Veal broth	0	0	0	0	0	0	0	0	0	0
"K" medium	0	0	0	0	0	½	1	2	2	1

Here 0 represents satisfactory protection, 5 represents complete coagulation and precipitation of the gold, and the intermediate numbers represent varying degrees of aggregation of the gold ultramicrons. The figures in the first column are for the original concentrations; those in subsequent columns are the results for progressively doubled dilutions.

[1] SCIENCE, 77: 259, 1933.

[2] *Kolloid Zeitschrift*, 1921.

[3] H. Bechhold, "Colloids in Biology and Medicine," 1920.

[4] Zsigmondy, *lib. cit.*, pp. 79–89.

[5] SCIENCE, 75: 295–301, 1932.

[6] *Arch. Int. Med.*, 22: 496–516, 1918.