The biologist will find much to attract him and so will the industrialist, as well as the regular colloid chemist.

Naturally the author of the famous Freundlich adsorption formula would present an exhaustive treatment of adsorption, and this is justifiable, for adsorption is the backbone of colloid chemistry. The opposing arguments of Langmuir and Polanyi as to the thickness of adsorbed films, monomolecular or polymolecular, are given fully and fairly.

The author's clear thinking is illustrated by the following statement: "In comparing different adsorbents we must remember that the amount adsorbed, which is referred to unit weight of adsorbent, does not permit of any proper comparison. It includes two quantities which must be separated: first the *actual specific adsorptive power*, that is, the amount adsorbed per square centimeter of surface; and secondly, the *specific surface area*, that is, the extent of the surface of 1 gram of adsorbent."

It is interesting to note (p. 726) that, in using Debye and Scherrer's method of X-ray study of gels, fibers, etc., it is best to arrange ramie in parallel threads.

In discussing membranes and surface films Freundlich insists that semi-permeability can not be a question of a pure sieve action. "With a sieve action one should be able to arrange the membranes in a series in the order of their permeability. But this is by no means the case; a membrane particularly impermeable to the majority of substances may be more permeable to some substances than is a membrane which is otherwise, in general, permeable."

Enzymes receive extensive treatment under the topic, "The Kinetics of Reactions accelerated by Enzymes." Following this is a discussion of the "Inhibition of Biological Processes by Capillary-active Substances."

It is rather surprising to learn (p. 825) that precipitates of the hydroxides of aluminum and ferric iron formed rapidly by addition of ammonia to the corresponding salt solutions are amorphous, while the micellae of Al_2O_3 and Fe_2O_3 sols, formed slowly by hydrolysis, are crystalline (shown by Debye and Scherrer's methods).

On page 837 the author puts the brakes on Loeb's too-enthusiastic, too-general application of Donnan's equilibrium theory.

The thousands of references given in this great treatise add much to its value. But if one is overwhelmed by the 883 pages one can take refuge in Freundlich's little "Elements of Colloidal Chemistry."

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Deep Sea Fishing in New Zealand: Tales of the Angler's ElDorado, New Zealand. By ZANE GREY. New York, Harper Brothers.

MR. ZANE GREY, "the Izaak Walton of the open sea," the leading deep sea angler of the world, has opened a new field, an "Angler's ElDorado," in his experiences in and about the Bay of Islands, on the North Island of New Zealand. This body of water is a fair rival of Santa Catalina, Cape San Lucas and Southern Florida; three great centers of tuna, sailfish and marlins, which Mr. Grey has already explored.

Besides its thrilling interest to anglers, it has much of value to the ichthyologist in its excellent plates and accounts of distribution and habits. All these fishes (some reaching 1,400 pounds) are too large for bottling and only now and then can individuals be properly preserved and mounted. Most studies of them must be made through photographs.

The two species especially treated and figured by Mr. Grey in this work belong both to the genus *Makaira* or "Marlin-spike-fishes." One of these has been very lately named *Makaira zelandica* by Jordan and Evermann, on photographs from the Bay of Islandi, the other, as Mr. Grey asserts, is still unnamed and is called by him "the black marlin" to distinguish it from the striped marlin or *zelandica*. It is closely related to the huge "black marlin" (*Makaira marlina*) of the west coast of Mexico, but its fins are still lower and the spear shorter. In Jordan and Evermann's recent memoir on "The Giant Mackerel-like Fishes" of the world, the New Zealand "black marlin" is provisionally identified with the marlin of South Africa, *Makaira herscheli*. But this species has longer fins and a longer spear.

The generic *Makaira* must be used for the "marlin-spike-fishes," which differ from the sailfishes, *Istiophorus*, in the very low dorsal. *Tetrapturus*, the spear-fishes, a third genus, is intermediate, having a low dorsal also, but with the posterior spines relatively elevated, almost as long as those in front. No species of *Tetrapturus* is known from America, but species occur in the Mediterranean, in Hawaii and in Japan.

DAVID STARR JORDAN

SCIENTIFIC APPARATUS AND LABORATORY METHODS

"A F S," A NEW RESIN OF HIGH REFRACTIVE INDEX FOR MOUNTING MICROSCOPIC OBJECTS

A LARGE percentage of objects mounted on glass slides for examination through the microscope depend for their visibility upon the difference in refractive index of the object and the material in which it is embedded. The greater this difference, the greater is the contrast in the object and the finer is the detail which can be resolved. Also, the higher the refractive index of the embedding material the greater is the depth of focus (penetration) of any objective lens.

If an object has a refractive index of 1.43 (air = 1) it becomes invisible when mounted in material of the same index. It becomes increasingly more contrasty (visible) as the surrounding substance has its index reduced, but the limit in this direction is 1 or a dry mount. Therefore, for this and some other reasons, dry mounts have never been satisfactory. As the refractive index of the surrounding medium is increased above 1.43 the object becomes more and more contrasty. A great deal of research has been conducted in the past to discover a material suitable for mounting purposes and of high index and there is a large literature on the subject. Many chemicals have been investigated and almost the entire series of natural gums, resins and alkaloids. Up to the present time, however, and except for special purposes the microscopist has been limited to two or three natural resins or mixtures of resins, the refractive index of which is very low. He is, therefore, greatly handicapped at the start of his effort, which, in most cases, is to see as much as he can with his microscope. Of the common mountants, Canada balsam has come into almost universal use because it can be procured easily, is chemically stable and is easily manipulated. Long ago it was pointed out that the exudation of the American sweet gum tree, *Liquidambar styraciflua*, was superior to balsam, but it has not come into general use. This resin is sometimes called "styrax," but it should not be confused with an oriental product of that name used in pharmacy. Its refractive index is 1.58; Canada balsam is 1.53.

Even the liquid amber is not sufficiently high for many objects; in fact, it is desirable to have a series of mounting mediums, one end having the maximum attainable refractive index.

After making exhaustive experiments in many directions the assistance of Mr. Paul Ruedrich was solicited and we began a line of search through the synthetic resins. One of particular promise has been discovered and is noted in our records as "A F S." It is composed of analine, formaldehyde and sulphur. A range of refractive index from 1.68 to almost 2.0 has been obtained and after two months' standing it appears to be entirely stable. The discovery was made on October 8, 1926. It is a well-known fact that substances closely related to this resin are the most stable in organic chemistry and have come into wide industrial use within recent years. It can not of course be definitely proved to be stable until after years of observation, but present indications are that it will be. Certainly it will keep unaltered for a period of months. This substance is a yellow resin which can be used in a thick viscous condition or thinned down with aniline or other solvents. It is used in the same manner as Canada balsam and does not offer some of the difficulties encountered with that substance. It may be hardened in the air, in an oven or with stronger heat. Although yellow in color it effectively transmits the apple-green rays for which most microscopic objectives are corrected.

A comparison of the utility of mounting mediums is afforded by the "index of visibility" which is the amount of difference between the refractive index of object mounted and that of the medium used. Thus, if the silica of diatoms be used for illustration, its index of refraction being 1.43, its index of visibility in Canada balsam becomes 1.53 – 1.43 = .10. In liquid amber it is 1.52 – 1.43 = .15. This means, practically, that 50 per cent. greater utility is obtained from a given microscope if the object be mounted in the latter. In this "A F S" synthetic resin the visibility becomes 1.68 – 1.43 = .25, while in a solidified form it becomes 1.88 – 1.43 = .45; all intervening values may be had. Thus a diatom in "A S F" becomes four and a half times or 450 per cent. more visible than it would be in Canada balsam. The same principles apply with all objects, either stained or unstained.

Likewise, increase in depth of focus being directly proportional to the index of refraction of the mounting medium, this factor, so important in photomicrography, becomes almost twice as great in "A F S" as in balsam.

From the optical properties of this material and its ease of manipulation I am forced to the belief that it will enable the human eye to see that which no eye has seen before.

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THE CULTURE MEDIUM FOR DROSOPHILA

MR. M. CHINO, my co-worker on *Drosophila* in our laboratory, has devised a culture medium for the fly which consists of: 100 gr. peeled banana, 100 gr. kôji,[1] 10 gr. agar-agar and 800 cc of water, with a very small quantity of powdered magic yeast added to the mixture. Kôji has to be soaked in water over

[1] Culture of *Aspergillus oryzae* on rice, used for fermenting rice for brewing saké and also for various other purposes in Japan.