Most of this expansion has occurred in the sphere of physical oceanography. The incentive is partly military, partly prestige (the U.S.S.R. is also putting tremendous effort into this branch of science), and partly the feeling that this is the world's last major frontier, and that rich rewards will eventually follow on its opening-up. However, a rapid increase in expenditure in this way raises the problem of making sure that the effort is properly directed, and that the minimum of duplication takes place. To this end, the Government agencies have held briefing conferences for industry, and industry itself has got together in these 'Interindustrial Symposia'* to co-ordinate their efforts and to encourage oceanographic research generally.

Three of the four papers presented at the first symposium deal with the Co-operative Observation Weeks. This is a programme to study the marine layer of California, which is the layer of the atmosphere between the ocean and the temperature inversion at about 3,000 ft. A large number of both public and commercial organizations participated, and the investigations included the surface layer of the ocean. The papers give the background of the project, present a general discussion of the problems of air-sea interaction and discuss the temperature structure of the surface layers of the sea in the Santa Barbara Channel. The fourth paper describes the initial development of an airborne optical method for determining sea

surface slopes, knowledge of which is important, for example, in connexion with radar and underwater acoustics.

The emphasis at the second symposium was rather different, only one of the seven papers dealing with the programme of the Co-operative Observation Weeks. Three of the papers are concerned with the development of unattended buoys for collecting oceanographic information. Some oceanographic problems, such as studies of the movement of deep water and the collection of synoptic wave and temperature data, require data collection over a long period of time at a number of points. The only practicable way to do this is to use anchored unattended buoys which either collect and record the data, or transmit it over a radio telemetering system to a ship or shore station. Such buoys are being developed in several places (including Norway under NATO auspices). Two such systems are described, and one paper deals with the problem of telemetering information by radio from a large number of such buoys over the limited radio channels available. The other three papers deal with numerical wind-wave forecasting, acoustic scattering measurements as indicators of water inhomogeneities and the Hughes Research Program in Marine Geophysics and Oceanography.

One is left with the impression that firms in the United States do a surprising amount of oceanographic research, but that much of this is supported by public funds and is directly or indirectly aimed at defence applications.

M. J. TUCKER

* Lockheed Aircraft Corporation. *Proceedings of the First Interindustrial Oceanographic Symposium, Burbank, California, June 14, 1962.* Pp. 27. *Proceedings of the Second Interindustrial Oceanographic Symposium, Santa Barbara, California, December 11, 1962.* Pp. 51. (Burbank, Calif., Lockheed Aircraft Corporation.)

GELATINE AND GLUE RESEARCH

THE twenty-fifth meeting of the research panel of the Gelatine and Glue Research Association* was held on May 29 at the Strand Palace Hotel, London, W.C.2. The chairman of the Association, Mr. S. G. Hudson (Richard Hodgson and Sons, Beverley), presided and welcomed Mr. D. N. Carvalho and Mr. E. E. Werle (Darling and Co., Chicago) and Mr. T. V. Simpson (Canada Packers, Ltd., Toronto) to their first meeting as members of the Association.

The two morning papers were "Effect of Ionizing Radiation on Collagen", by Dr. A. J. Bailey (Low Temperature Research Station, Cambridge), and "Unusual Links and Cross-links in Collagen", by Mr. J. J. Harding (Medical Research Council grant, the Gelatine and Glue Research Association). The two papers were complementary, since Dr. Bailey discussed the formation of new cross-links in the unusual type of collagen existing in rat tail tendon, while Mr. Harding discussed recent work on the structure of cross-links already existing in mature collagen. In the presence of isotonic saline, irradiation causes a progressive lowering of shrinkage temperature (for example, by 14° C after 5 Mrads) which is accompanied by increased shortening of fibres during thermal shrinkage, by decreased solubility and by decreased tensile strength. However, if the influence of hydrogen bonds in the tendons is eliminated by thermal contraction, then the tensile strength of irradiated samples is higher than that of thermally contracted control samples. Dr. Bailey concluded that irradiation disrupts some of the helical structure and produces new thermally stable bonds. Dr. J. Bowes and Mr. C. W. Cater (British Leather Manufacturers' Research Association) have made stress-strain measurements of irradiated, thermally shrunk fibres, estimating that the number of cross-links per tropocollagen unit of $M = 360,000$ rises from 1 to 36 after 46 Mrads.

* Until April 1963 this was the British Gelatine and Glue Research Association. The change of name was made in recognition of the growing international membership of the Association.

The most probable cross-linking site is thought to be the side-chains of the polar amino-acids, and chemical investigations are in progress to explore the structure formed which may arise from a radical reaction resulting in carbon-carbon bonding. It is believed that in mature collagens there are unusual links which have not yet been found to any extent in other proteins. A voluminous and expanding literature exists on the occurrence of ester links, γ -glutamyl links, ϵ -amino lysine links and links through bound hexose residues. Mr. Harding reviewed the present position, which has a considerable bearing on his own attempts to compare human collagens from different organs. The discussion on these two papers, which was opened by Dr. Bowes, served to emphasize the difficulties of interpreting experimental results on the nature of natural and induced cross-links in collagen. It is, however, clear that considerable progress is at last being made.

In the afternoon, two papers of practical interest to the glue and gelatine industry were read. Mr. B. E. Purkiss (British Drug Houses, Ltd.) and Mr. J. R. Marsh (Cork Manufacturing Co., Ltd.) contributed "Fungicides for Composition Cork". They have recently solved the problem of finding a satisfactory fungicide for this material. The fungicide is the magnesium derivative of dehydroacetic acid and has been given the trade name 'Lastil'. Finally, Mr. F. W. Wainwright (The Gelatine and Glue Research Association) described and demonstrated "The Redesigned Bloom Gelometer", which incorporates the improvements made by the Association in collaboration with Messrs. Griffin and George, Ltd., over a number of years. The redesigned instrument is capable of giving more accurate and reproducible results and is now available commercially. Mr. Wainwright has revised the Association's *Research Report* (Series B.7) on "The Standardization of Bloom Jelly Strength Testing", by D. Fysh and A. G. Ward, in order to include operating instructions for the new instrument. D. A. SUTTON