syndrome but not in normal persons, appeared to occur more often than usual among children with leukemia. Miller reviewed clinical and epidemiologic evidence for the excessive occurrence of childhood cancer and congenital defects in the same person, family, or community. Through such concurrences, one may be able to recognize common agents or mechanisms in the genesis of the associated diseases.

W. M. Haenszel (National Institutes of Health) described retrospective epidemiologic studies in progress concerning cancer of the stomach and lung in Japanese migrants to Hawaii and California as compared with the experience in Japan. Differences in the histories obtained in the three locales may be of etiologic significance. Hirayama presented the rates for causes of death in the converse situation, namely, among foreigners in Japan in contrast to the native population. K. G. Johnson (Atomic Bomb Casualty Commission) told of clinical cardiovascular studies on cohorts of Japanese in Hiroshima for comparison with issei and nisei in Honolulu.

M. Segi (Tohoku University) noted the variations in cancer rates within Japan and compared the rates for all Japan with those of other countries. Most notable was the very high Japanese rates for stomach cancer, the occurrence of which was particularly frequent in certain prefectures, such as Nara.

E. Matsunaga (National Institute of Genetics) showed that certain epidemiologic characteristics of Down's syndrome were the same in Japan as in Western countries, and that new observations from study of the *koseki* record indicate an association between the syndrome and (i) birth order and (ii) pregnancy-free interval between succeeding livebirths—an association which may suggest a hormonal means for suppressing chromosomal aberrations. M. Hayashi (Toho University) reported on the frequency in Japan of congenital malformations in the newborn (0.73 percent of 83,988 deliveries in 1961) and some epidemiologic data on phocomelia that was induced by thalidomide.

P. Kotin (National Institutes of Health) spoke of the interaction between epidemiologic and laboratory research, and of the problems and techniques common to oncology and teratology. He stressed that observations from either discipline may well apply to the other.

Several participants urged that steps be taken to standardize methods, terminology, and definitions to improve international comparisons of results from medical research. Blandau noted the exceptional opportunity in Japan for the study of the development of the normal human embryo. J. Warkany (University of Cincinnati) suggested the establishment of informal small groups of scientists in the United States and Japan through which questions about oncology and teratology (literature and resources) in the two countries could be channeled. There was some concern on the Japanese side that the function of these groups might conflict with that of existing organizations. Soda cited the Atomic Bomb Casualty Commission in Hiroshima and Nagasaki as an exceptional resource for epidemiologic competence and for a wide spectrum of research on human development and disease.

It was suggested that U.S. embryologists, teratologists, epidemiologists, and biostatisticians be encouraged to work at Japanese universities and institutes under the sponsorship of the U.S.–Japan Cooperative Science Program. A series of recommendations was also made to facilitate cooperative research between the two nations in embryology, teratology, and cancer epidemiology. It was emphasized that there was no intent to alter the current administration or funding of research in these fields.

R. W. MILLER
National Cancer Institute, National Institutes of Health, Bethesda, Maryland

H. NISHIMURA
Kyoto University, Kyoto, Japan

Seaweed

Marine algae are important because of their applications in agriculture and also as a possible source of food for man. In order to foster original research, both fundamental and applied, in the field of marine algae, the 5th International Seaweed Symposium was held in Halifax, Nova Scotia, 25–28 August. The topics at this symposium were evenly divided among botanical, chemical, and applied aspects. A symposium within a symposium developed on the subject of algal polysaccharides.

In discussing the seaweed industry of the future, F. N. Woodward (Scotland) stressed the possibilities of mass culture as a source of protein; the cultivation of areas for selected species, as in Japan; and the great need for mechanization in harvesting and drying. He also noted the possibilities of further applications of the unique algal polysaccharides in agriculture, industry, and medicine. The use of mustard, *Sinapis alba*, as a test plant with which to assess growth response to seaweed extracts was described by Challen and Hemingway (United Kingdom). Stephenson (United Kingdom) reported specific effects from the use of liquid seaweed fertilizer; the use of such fertilizer increased the resistance of some field crops to frost, to pathological fungi, such as *Botrytis*, on strawberries, and to animal parasites, such as aphids, on beans and sugar beets.

Recent studies by Araki (Japan) on the polysaccharides of agarophytes, revealed the chemical constitution of agarose and agaropectin. Sulfate groups as half-esters were established in agaropectin only. The remarkable finding of variable, but appreciable, amounts (1 to 20 percent) of 6-*O*-methyl-D-galactose in agarose was reported. Pyruvic acid was confirmed as a constituent of only two agaropectins. In agarose the molar ratio of D-galactose + 6-*O*-methyl-D-galactose to 3,6-anhydro-L-galactose was always unity.

Anderson and Rees (Scotland) have found that carrabiose units account for 88 to 99 percent of the molecule of κ and λ carrageenans based on the products after methanolysis of native and alkali-treated material. A new, widely distributed, sulfated heteroglycan, isolated first from *Ascophyllum*, has been discovered by Larsen and Haug (Norway) and named ascophyllan. It contains fucose, xylose, and a uronic acid. The uneven distribution of mannuronic and guluronic acids in the main chain of alginic acid was postulated by Haug and Larsen (Norway) from studies of partial hydrolysis with oxalic acid. The isolation of specific κ and λ carrageenases from *Pseudomonas carrageenovora* was reported by Yaphe and co-workers (Canada).

The finding of pure poly-*N*-acetylglucosamine as the only constituent of the extracellular fibers of the diatom, *Thalassiosera fluviatilis*, by McLachlan,

McInnes, Falk, and Craigie (Canada) provides the only instance in nature of the occurrence of this substance in pure form. It has been renamed chitan. Two other unusual compounds, dimethyl-β-propiothetin and 2,3-dibromobenzyl alcohol-4,5-disulfate, were reported in marine algae.

Black *et al.* (Scotland) surveyed many of the Rhodophyceae as possible sources of the carrageenans. Marked variation in yield, ratio, optical rotation, and chemical composition was recorded. Sharp fractionation into κ and λ components with KCl was not always achieved (for example, it did not occur in *Eucheuma spinosum* and *Polyides rotundus*). Fleming, Hirst, and Manners (Scotland) have found notable similarity in the soluble and insoluble forms of laminarin except that the former exhibits a greater degree of branching. Painter (United Kingdom) presented evidence that the sulfate group in the galactose of λ-carrageenan and furcellaran is more or less randomly distributed over all available hydroxyl groups in the carbohydrate chains and not only attached at carbon No. 4 as previously believed.

The unexpected property of some seaweeds to "fix" radioactive ions was described by Czapke (Poland) and and Skoryna and co-workers (Canada). The current explanation is based on ion exchange with soluble or insoluble alginate. This property was applied as an index of the radioactivity of the aqueous environment and as a means of inhibiting absorption of strontium-89 in the gastro-intestinal tract of animals.

In a study of the tissues of *Fucus*, McCully (United States) found differences between the walls of the outer epidermal cells with their amorphous outer layer, and the underlying parenchyma and the central medulla with its reticulum of branched primary filaments and secondary intrusive fibers. All were embedded in a mucilaginous matrix. Observations with the light microscope, with specific stains, and with electron microscopy of adjacent sections, suggest that fucoidin is confined almost entirely to the mucilaginous matrix, whereas cellulose and alginic acid are in well-defined bands in the fibrillar portions of all the walls. A similar topic was discussed by Baardseth (Norway) who examined the localization and structure of alginate gels from *Ascophyllum*. Baardseth believes that alginates exist mainly as intercellular substances at all stages of development and finds no evidence for two walls (a primary wall of alginate, and a secondary wall of cellulose) in brown algae.

Chapman (New Zealand) discussed the physiological ecology of seaweeds. For a number of the macroscopic algae which are found on the coasts of Australia and New Zealand, Chapman showed how physical factors, which affect their distribution, can also effect morphological variations. His data suggest that changes in light, temperature, depth, desiccation, and other factors could influence the ability of the algae to function at their optimum and hence could be responsible for the limits of distribution.

Kain (United Kingdom) showed that the lower number of *Laminaria hyperborea* in the Isle of Man may be determined partly by biotic factors: removal of colonies of *Echinus esculentus* from the lower limits of beds of *L. hyperborea* and *Saccorhiza polyschides* has resulted in new algal growth over rocks at a level that remained bare when *Echinus* was present. Leighton, Jones, and North (United States) have developed a method of treatment with quicklime to control the infestation of beds of *Macrocystis* by such sea urchins in the Pacific Ocean. Many phaeophycean genera are known to produce tannins; Conover and Sieburth (United States) showed that these metabolites may influence the ability of certain organisms to grow in confined bodies of water.

Anderson and North (United States) described ways in which estimates of the extent of sporing in *Macrocystis* have been made *in situ*. For isolated plants sporelings have been found up to 5 meters away. This is an indication that the spores sink relatively quickly and do not wash about in the sea for any great length of time. Conway (Scotland) described the extensive sporing of species of *Porphyra* and the microscopic perennating phases into which the spores develop. Such phases may be of considerable ecological importance to this widely distributed genus. Aziz (Pakistan) reported for the first time sexual reproduction in *Acrochaetium liagorae* Börg.

In one of two sessions devoted to the algal flora of the Antarctic, Lamb (United States) described the pattern of distribution seen in the supralittoral, littoral, and infralittoral zones at the Argentine base at Melchior. Early in the southern summer almost no vegetation is visible on the littoral rocks. Once colonization begins in the gullies, development is very rapid and spreads across the zone. Examination of the infralittoral by Scuba diving showed marked zonation with some of the major algae, including *Desmarestia*, down to 30 meters. Zaneveld (United States) described surveys carried out along the coasts of Ross Island and Victoria Land, Antarctica, often through enlarged seal holes. These showed that large algal beds were present at depths between 6 and 35 meters, with red algae, such as *Phyllophora antarctica, Iridaea obovata* and *Phycodrys quercifolia*, as the dominant species. Light measurements emphasized the paucity of light in such a habitat (about 1.1 percent of the surface values) and showed that benthic algae are capable of photosynthetic production under solid ice for 9 to 10 months.

Friedmann (Israel) described the occurrence in Mediterranean waters of numerous gametophytes of *Padina pavonica* and of the Indo-Pacific species *P. gymnospora*. Much variation in the occurrence of bisexual and unisexual forms is found. There are indications that the variation in different populations is controlled by ecological factors. Moss (United Kingdom) indicated the importance of the large apical cell in *Fucus vesiculosus*. Round (United Kingdom) has observed rhythms in migration of *Euglena obtusa* and of certain diatoms, and the effect of varying the normal day-length pattern.

Most of the papers will appear in the official proceedings to be published by Pergamon Press in London in 1966. There were 220 registrants from 25 different countries at the symposium. During the symposium a meeting of the International Phycological Society was also held. The 6th symposium will be held in Spain in 1968 according to present plans. A permanent secretariat for the symposiums has been established. Mr. E. Booth, Institute of Seaweed Research, Inveresk, Midlothian, Scotland, is in charge.

ELSIE CONWAY
Department of Botany, The University, Glasgow, Scotland

E. GORDON YOUNG
National Research Council, Halifax, Nova Scotia, Canada