ciated as it is with a spectrum of early, though somewhat peculiar, type, has an important significance in relation to some of the suggested explanations of the tardy motions of isolated helium stars.

THE INSTITUTION OF NAVAL ARCHITECTS.

THE spring meetings of the Institution of Naval Architects were held on April 12 and 13, at the Royal Society of Arts. The Marquis of Bristol's term of office as president has now expired, and he has been succeeded by the Earl of Durham. The institution scholarship has been awarded to Mr. T. S. D. Collins; a donation of 100*l.* has been made to the scholarship fund by the Earl of Durham; the annual gold medal has been awarded to Mr. A. W. Johns, and the premium to Mr. J. L. Kent, for papers read before the institution. The following members of the institution have been appointed to the Board of Trade Committee to consider the position of shipping and shipbuilding industries after the war:—Sir A. A. Booth (chairman), Sir Archibald Denny, Mr. W. S. Abell, and Mr. James Readhead. A presentation was made to the retiring president.

In the course of the Earl of Durham's address, he said that one paramount duty was before the whole nation—to prosecute the war until a satisfactory end was reached. Our naval architects had no better pride than to turn out everything destined for the Navy of the best possible quality. When the end of the war came he felt sure that the institution would be able to claim having done its share in the work.

Sir Philip Watts read a paper on the load lines of merchant ships, and the work of the Load Line Committee (1915). This paper consists largely of a historical summary, starting with the earliest recorded regulation, which appeared in Lloyd's Register book in 1774. The remainder of the paper gives the gist of the report of the Load Line Committee, presented in a form convenient for the purposes of the institution. Mr. W. S. Abell followed with a paper on some questions in connection with the work of the Load Line Committee. The question principally discussed is the formulation of a suitable standard of structural strength which might be adopted internationally for the necessary tests which it is desirable to lay down in order that the freeboard assigned shall not be so small as to bring undue strains upon the structure of a vessel. The rules of the registration societies have been developed from experience, and should form the basis of any analysis having for its object a general average of experience with ship structures at sea. The method adopted was to analyse the rules of the principal societies in terms of l/y, and the principal dimensions of the vessel with the view of obtaining a standard of longitudinal strength which would express rationally the minimum requirements found necessary from successful sea experience. In this way formulæ were found for the standard of longitudinal strength, the thickness of side plating, frame spacing, and the strength of hold frames. This paper is a valuable summary of some interesting work on the strength of ship structures.

Dr. C. H. Lees read a paper on the laws of skin friction of a fluid in stream line and in turbulent motion along a solid of great length. In this paper Dr. Lees shows how to reduce the problem of a very long body of rectangular or elliptic section towed along a wide tube filled with liquid, to the simpler problem of a long circular cylinder towed along the same wide tube, so long as the liquid moving past the body is in stream-line motion. Comparison of results calculated for the equivalent cylinder and Froude's boards shows very fair agreement for the last 34 ft. of the boards. The agreement is sufficiently close to show that there is in all probability an intimate connection between the frictional resistance of the after portion of a long towed body and that of water flowing through a pipe. It seems desirable that experiments should be made with the view of determining to what extent the propositions with regard to bodies of equivalent resistance in stream-line motion may be carried over to eddying motion, and, if it should prove they cannot be, to determine the corresponding propositions for eddying motion.

Mr. G. S. Baker contributed a paper on the skin friction resistance of ships, and our useful knowledge of the subject. The data for the friction of rough surfaces have been increased very considerably in the last few years. Most of the data are derived from model experiments, but in some cases authentic data for ships are available. One model of fine form, 16 ft. in length, tested in the National Tank, showed that plate edges increased the frictional resistance 3·7 per cent. The plates on the model represented 4-ft. strakes of $\frac{3}{4}$-in. plating on a 400-ft. ship. A plate, 20 ft. by 2 ft., tested in the Washington tank after immersion in Chesapeake Bay for two months (July and August, 1914) showed an increase in resistance over that of a smooth surface of about 50 per cent. The fouling and resistance went on increasing up to the month of December, when the resistance stood at about 220 per cent. increase over that for a smooth surface, and remained at that figure for some months. This suggests that a good time for cleaning and painting the bottoms of coasting ships, working at about this latitude, is October and November, as there is little growth in cold water for the next few months. Presumably there would be a period about May and June when the temperature had reached a point favourable for growth, when a new coat of paint would prevent the adhesion of growth to the surface.

In a paper on the subdivision of merchant vessels and the Reports of the Bulkhead Committee, 1912–15, Sir Archibald Denny suggests that, after the war is over, an interesting paper might be written dealing with the mass of information which will no doubt be available as to the behaviour of vessels damaged either sufficiently or insufficiently to sink them. It is interesting to know that many vessels have survived torpedo and mine attack, even when the damage was of a very extensive character. Thus the *Nigretia* struck a mine abaft the fore peak, and had a hole 40 ft. by 16 ft. blown in her, but she was saved by No. 2 bulkhead. The Germans also have not always realised the difficulty of sinking an oil-carrier, especially if she is running light—*vide* the *Artemis*. The tests made by the Bulkhead Committee on large tank bulkheads are described in a paper by Mr. J. Foster King. Drawings showing the deflection records and photographs of the bulkheads are included. In all, fourteen papers were read and discussed.

DANISH LABOUR ON BRITISH FARMS.

THE Board of Agriculture proposes to relieve the present shortage of labour on the farm by arranging for the introduction of agricultural workers from Denmark. In this connection attention may be directed to an exceptionally interesting article by Mr. J. Robertson Scott in the January number of the *Quarterly Review*.

The wonderful development of rural life in Denmark is largely due to the absence of coal and iron. Having practically no manufacturing industries, the Danes

have put their best brains and energies into the cause of agriculture, with the result that their system of rural economics is a model to the world. The high standard of agricultural education is chiefly responsible for this success; it is significant that 20,000 Danish farmers possess covered manure sheds, while 90,000 have water-tight liquid manure tanks. But in comparing this state of affairs with conditions on our farms at home, it must always be remembered that our system of land tenure does not favour similar development here. It is not only ignorance that still causes so much of the fertilising value of farmyard manure to be lost by careless storage. The Danish farmer, owning his holding, is able to borrow from his credit society the capital necessary for these improvements; the English tenant farmer is not in the same position. Many landlords cannot provide these aids to successful farming, even if they realise that it is to their ultimate advantage to do so.

It is, however, to the rural high school that we must look as the real source of Denmark's present agricultural prosperity. It may surprise many to learn that no merely utilitarian outlook dominates these schools. On the contrary, they endeavour to show the power of history, poetry, and science, and of a higher level of life and thought to glorify ordinary workaday existence. How will a man trained in an atmosphere of this kind fill the place of a typical agricultural labourer on our farms? If Danish workers are introduced in any numbers into English rural life the results cannot fail to be of great interest.

THE CULTIVATION OF SPONGES.

AN industry which promises a return of 3000 per cent. per annum on a very moderate capital expenditure is an attractive proposition. In the last issue of the *West Indian Bulletin* Mr. W. R. Dunlop describes the successful rearing of sponges from cuttings in the Caicos Islands, near Jamaica, and also the results of some earlier experiments in Florida. The sponges occurring naturally in West Indian waters have little commercial value, so that the material for planting must be imported. Although sponges are to a remarkable extent creatures of environment, and tend when transplanted to approach the native types in quality, there is evidence that this may not occur in selected localities in the Lesser Antilles. As the cuttings will only grow when attached to an anchorage, it is necessary to provide them with suitable means of support when planting out. Cement discs are used in Florida, to which the sponges are held by metal clips, but it has been found in the Caicos Islands that slabs of coral are quite as effective as the discs and naturally much cheaper. On soft or sandy bottoms a spindle is set in the disc to hold the cutting, otherwise the sinking of the disc tends to bury the sponge and kill it.

The crop is ripe for harvesting in from one to four years, according to the variety grown. To plant, harvest, and market one acre of sheep's-wool sponges costs about 4*l*. This is a large and valuable variety, taking four years to mature, and yielding 116*l*. per acre in the New York market. Assuming that one acre is planted each year, then, after four years, an annual expenditure of 4*l*. will yield an annual profit of 112*l*., if four acres only are under cultivation. No charge for management is included in this estimate. The growers in the Caicos find that the small reef sponges, in spite of their lower market value, give an even better return on capital than the wool sponges, because they mature in twelve or fourteen months. It will be surprising if this industry, apparently so profitable, needs much official encouragement.

NATIONAL ASPECTS OF CHEMISTRY.[1]

EXACTLY seventy-five years ago from March 30, 1916, the Chemical Society met for the first time at the Royal Society of Arts after a preliminary meeting on February 23, 1841, at which it was decided "that it is expedient that a Chemical Society be formed." Though the society has continued to hold its anniversary meetings on or about March 30, ever since then, under various conditions, no meeting except that in 1915 has ever been held in circumstances at all approaching those now prevailing throughout the entire globe. The Crimean and Boer Wars did not awaken in the nation any appreciation of the increasingly important *rôle* played by chemical science in warfare. On the other hand, the enormous possibilities for the destruction of human life afforded by the application of scientific methods to warfare had inclined people to the belief that such a war as the present, with its ruthless disregard of life, could never occur. Short of demonstration, chemists would never have believed that their science could have been prostituted as it has been by the enemy.

Many thoughts arise in our minds on such an occasion as the seventy-fifth anniversary of our society, leading us to reflect on the state of chemical science before 1841, on the aims and purposes for which it was deemed expedient to form such a society, and to examine the measure of success that has been achieved by the society in fulfilling the objects as laid down in the charter.

Reference was made to various letters received from the founders of the society, and to one in particular from Henry Fox Talbot, the well-known pioneer in photography, expressing the view that the science of chemistry alone was not sufficient to engage the attention of a society, and suggesting that electricity should be added. How erroneous was this view is shown by the fact that within a month or so of its formation the Pharmaceutical Society was founded, and of later years, amongst other societies which have sprung from the parent society, may be mentioned the Society of Public Analysts, the Institute of Chemistry, and the Society of Chemical Industry, each of which has its important functions to perform.

Looking back to the time of the "father of chemistry and brother of the Earl of Cork," who in his introduction to the "Sceptical Chymist," stated "that of late chymistry begins, as indeed it deserves, to be cultivated by learned men, who before despised it; and to be pretended to by many, who never cultivated it, that they may not be thought to be ignorant of it," one may indeed wonder, on perusing our Parliamentary and legal reports, how our legislators should be classed in accordance with this statement, and to doubt whether the attitude of so-called learned men towards chemistry had done more than "begin" to change during the last two centuries. The beginnings of this change and the initiation of the experimental method into true science by Robert Boyle and his contemporaries followed closely upon the Civil War. For a hundred years or so onwards from the time of Boyle, the gradual substitution of careful experimental work in place of speculation on the reasons for chemical and physical changes added greatly to our knowledge. The rise and development of the phlogistic theory and its final overthrow by Lavoisier illustrate this phase in the growth of our science. The vast strides made in the progress of chemistry date back to the time when the use of the chemical balance was insisted on by Black; by its use chemistry became an exact science. Black's modesty and his devotion to scientific inves-

[1] Abstract of the Presidential Address, entitled "Our Seventy-fifth Anniversary," delivered before the Chemical Society on April 6, by Dr. Alexander Scott, F.R.S.