tion. The other chapters appear to date from about 1935. While regretting this delay, oceanographers will acknowledge the readiness with which the data have been made available in manuscript form at any time since 1931.

A large section of the physical report deals with the accuracy of the methods of observation. A deep-sea thermometer is suspended fairly rigidly in a stout sealed glass tube which protects it from the effect of pressure. The reading is obtained by arranging to break the mercury thread by making the thermometer turn over in a frame at the required depth. Minor corrections have to be applied, but an analysis of the *Carnegie* measurements indicates that the error in the final reading of a single thermometer was usually considerably less than $\pm 0{\cdot}045°$. By using a pair of thermometers at each depth, the accuracy was increased.

The depth of the observation cannot be assumed to be the same as the length of wire used in lowering the instruments, because surface drift, and possibly undercurrents, make the wire take an appreciable angle from the vertical. The discrepancy is measured by the comparison of readings of two thermometers, one protected against pressure, and the other unprotected and calibrated to show the effect of pressure. A comparison of such measurements with the wire-lengths when the wire was more or less vertical indicated that the thermometer depth measurement was usually reliable to within 1 per cent at 1,000 metres and 0·5 per cent at 5,000 metres. Tables and graphs are given for correcting thermometer readings; but it is believed that they will not be found so generally useful as those by Geissler (1931)[3] and Schumacher (1935)[4], not mentioned in the report.

The *Carnegie* wire soundings were also checked by thermometric depth measurements. Whenever possible the ratio of thermometric depth to length of wire paid out was plotted against the measured angle of the wire at the surface, and the points fall fairly closely about a curve. The depth factor taken from this curve is 0·99 for an angle of 10°, and 0·90 for an angle of 60°. The factors would not necessarily be the same for a different vessel, or one differently manœuvred. The weak point of the *Carnegie* echo-sounder was its timing device, and it has been found necessary to correct the soundings by factors based on the comparison of wire soundings and echo-soundings when they were made close together. When the Fessenden oscillator failed, they used an improvised shot-gun, fired a foot or two below the surface, and made allowance for the greater initial velocity of sound from such an explosive source. It is worth noting that the ultimate standard for the depth measurements was the calibration of the unprotected thermometers, shown to be fairly reliable by the measurements on wires that were nearly vertical.

The analyses of the salinity of sea water were made by measuring the electrical conductivity of samples at carefully controlled temperature. It was a substitution method using water of known salinity. The errors in the determinations proved to be greater than those expected from the titration with silver nitrate, and the electrical method is not likely to replace titration in general use. Minor deviations from the controlled temperature are probably the chief source of error, and they are difficult to avoid.

The second part of the report deals with the information which has been gained from the measurements. One of the most interesting features is a wealth of new information about the deep-water layers in the Pacific Ocean. The measurements confirm that no highly saline water sinks from the surface into the deep layer, and the highest salinities in the deep water are found near the bottom where water of Atlantic and Indian Ocean origin creeps slowly northwards from the Southern Ocean. Compared with the deep-water circulation in the Atlantic Ocean, the Pacific deep-water movements are very sluggish.

The measurements of oxygen, phosphate, silicate and *p*H, described in the report on chemical results, are in close agreement with the conclusions based on temperature and salinity. The concentrations of phosphate and silicate in the deep water are unusually high, and the oxygen contents and *p*H values unusually low, all indicating that the deep water is long removed from the photosynthetic activity of the surface layer, and that there has been time for an abnormal increase in the products of oxidation and decomposition of organic material.

G. E. R. Deacon.

[1] Scientific Results of Cruise VII of the *Carnegie* during 1928–1929 under Command of Captain J. P. Ault. Oceanography IA: Observations and Results in Physical Oceanography. By H. U. Sverdrup, F. M. Soule, J. A. Fleming and C. C. Ennis. Pp. vii+156. 1.75 dollars. Chemistry 1: Chemical Results of the last Cruise of the *Carnegie*. By Herbert W. Graham and Erik G. Moberg. Pp. vii+56. 1 dollar. (Carnegie Institution of Washington Publications 545 and 562.) (Washington, D.C.: Carnegie Institution, 1944.)

[2] "The Last Cruise of the *Carnegie*". By J. Harland Paul. (Baltimore, Md.: Williams and Wilkins Co., 1932.)

[3] "Tiefenmessung mit ungeschützten Thermometern", by H. Geissler. *Ann. Hydrog. u. Mar. Meteorol.*, **69**, xii, 433–438, Plate 45 (1931).

[4] "Kipptthermometertafeln neuberechnet auf Grund der Formeln, von W. Hansen". By A. Schumacher. *Ann. Hydrog. u. Mar. Meteorol.*, **63**, vi, 237–239, Plates 33–36 (1935).

THATCH GRASS

IMPERATA cylindrica (L.) Beauv., which is a widespread grass of the tropics and sub-tropics, thrives on abandoned or poorly cultivated land. Although it may provide fodder suitable for very primitive types of agriculture, it is undoubtedly a troublesome weed which as the result of present upheavals is likely to become even more of a problem than in the past. For this reason a recent publication solely concerned with this species is particularly appropriate*. The booklet, in which five authors collaborate to cull the available literature, is of considerable interest not merely to the agriculturist but also to everyone at all interested in the grasses.

At the beginning is a chapter by C. E. Hubbard on the taxonomy of the species and its five varieties. His lucid explanation of the synonymy and the position with regard to varieties make delightfully smooth reading of an aspect which must have been difficult both to straighten out and to express so clearly. He admits five varieties, of which *major* (Nees) C.E.H. is the most widespread, being found in South-east Africa and Ceylon as well as throughout India, Malaya, Indo-China, the western Pacific Islands and Australia. The variety *africana* (Anderss) C.E.H. occupies a region in Africa south of the tropic of Cancer; var. *europœa* (Anderss) Asch. & Graeb. is confined to an area round the Mediterranean and eastwards across a strip south of the Caspian to Afghanistan; var. *latifolia* (Hook. f.) C.E.H. occurs

* *Imperata cylindrica*: Taxonomy, Distribution, Economic Significance and Control. Imperial Agric. Bur. Joint Pub. No. 7. Pp. 63. (Imp. Forestry Bureau, Oxford, and Imp. Bureau of Pastures, Aberystwyth.) 2*s*. 6*d*.

only in North India, and var. *condensata* (Steud.) Hack. ex Stuckert is a native of Chile.

Imperata cylindrica ($S=20$) belongs to the tribe *Andropogoneæ*, and Janaki-Ammal has succeeded in obtaining fertile hybrids with *Saccharum*, using, for the ovule parent, plants of the clone P.O.J. 2725 ($S=106$), which itself is derived from the cross *S. officinarum* ($S=80$) × *S. spontaneum* ($S=112$) backcrossed twice with *S. officinarum*.

Unfortunately, the section on the anatomy of *Imperata* falls short of the level of the rest of the work. As it is difficult to convey much information by description alone, there would have been a considerable gain if only a single plate of figures redrawn or copied from the literature could have been substituted for part of the text. Mere descriptions are very inadequate, especially when in a compilation of this sort there seems a tendency to quote authorities just because they have made a statement, regardless of how absurd it may be. For example, what use is there in quoting Duval-Jouve (1875) as saying that round the bundle "There is an inner ring of cells without chloroplasts, the colouring matter being diffused throughout the cell", suggesting that the chlorophyll is either dissolved in the vacuoles or diffused through the cytoplasm? Again, merely saying that in var. *major* "Each vascular bundle of the first order is surrounded with a two-layered bundle sheath, the inner sclerotic, the outer thin walled" might suggest to the uninitiated that *Imperata* should belong to the Pooideæ: a few simple drawings, possibly from Vickery, would have been much more useful than any description.

Although *Imperata* is able to withstand great variation in temperature and will grow up to 2,000 m., and only extreme aridity will prevent it from growing in areas otherwise suitable, it is essentially a tropical or sub-tropical plant. It is light-loving and rapidly colonizes cleared ground or abandoned plantations, spreading profusely by 'seeds' and rhizomes which grow out vigorously from the short basal internodes of the aerial shoots. Its ability to regenerate quickly after firing is one of the factors which make it a menace where primitive shifting cultivation is practised.

Although there are reports of *Imperata* being useful as a nurse crop, it is probably never the best plant for the purpose and is often very harmful later. Again, even if cut continually to encourage a more palatable growth, the general opinion is that it is not a good fodder plant and could probably always be replaced by a better species. (In the chapter on grazing value, an improvement would have been made by stating in Tables 3–5 which are as percentages of dry weight and which as wet weight, and perhaps also, to have included dry-weight percentages in Table 4 for easy comparison with the others.)

After reading the chapters recording the black marks against the species, it is somewhat of a relief to learn that it is apparently the thatch plant *par excellence* and is often cultivated carefully for this purpose, alone. No doubt this will lead to a struggle between the various interests in the future.

Its suitability for paper-making is negligible owing to (1) the difficulty of obtaining a product of good colour without excessive bleaching treatment, (2) the short fibre-length, and (3) the impossibility of obtaining sufficiently large and constant supplies of a uniform quality within the economic radius of a mill.

With regard to control, mechanical methods such as ploughing and hoeing are effective especially if persistently employed; but perhaps the line which may be most usefully followed is the exploitation of the plant's intolerance of shade, either by encouraging re-afforestation or by sowing smother crops.

Except for the bibliography, a five-page list of common names in various languages and dialects completes this pleasing little work. If this could be the first of a number of booklets of this type, the others would certainly be at least as welcome, especially at the low price of half-a-crown.

B. C. Sharman.

THE IMPERIAL CANCER RESEARCH FUND

THE forty-second annual report of the Imperial Cancer Research Fund* includes an account of progress made in scientific work in the laboratories at Mill Hill.

Mr. H. G. Crabtree has continued his investigations on the effect of substances which retard the carcinogenic action of 3 : 4-benzpyrene and 1 : 2 : 5 : 6-dibenzanthracene painted on the skin of mice. Bromobenzene and unsaturated dibasic acids, which readily combine with sulphydryl groups, are able to neutralize carcinogenic action. On the other hand, aldehydes, which form unstable derivatives with sulphydryl compounds, have only a slight inhibitory action on carcinogenesis. Another aspect of carcinogenesis, namely, the stimulating effect of wound healing, has been studied by Dr. D. B. Pullinger. She finds that multiple injuries followed by healing may double the incidence of tumours caused by painting with carcinogens. The effect is greatest when the more potent agents are used; with weak or intermediate carcinogens the effect is negligible. The more active carcinogens are presumably able to overcome resistance to the neoplastic change.

The relation of mammary cancer and the milk factor or mammary tumour inciter, present in the tissue of mice belonging to strains susceptible to mammary cancer, has been further investigated by Dr. L. Dmochowski. The factor, derived from any high-cancer strain mice, can induce breast cancer in susceptible strains although their genetic constitution differs from that of the strain from which the milk factor was obtained. Breeding females of low-cancer strain mice do not themselves develop breast cancer even after injection of large doses of the mammary tumour inciter. A proportion, however, of their offspring, both females and œstrone-painted males, develop mammary cancer. The effect of the milk factor was originally shown by foster-nursing young mice immediately after birth. Now, however, tumours have been induced by injecting relatively large doses of material into four-month old mice with well-developed mammary glands. The mammary tumour inciter has no direct influence on the incidence of lung cancer. The sarcomatous transformation of the stroma of cancers is probably independent of the milk factor as it takes place in lung tumours free of mammary tumour inciter. Dr. R. J. Ludford and Miss H. Barlow find that tissue of a lung tumour from a mouse without milk factor is just as active in causing fibroblastic growth in tissue culture as was tissue from similar tumours from mice containing the milk factor.

* Imperial Cancer Research Fund. Forty-second Annual Report, 1944–1945. Pp. 32. (London: Royal College of Surgeons.)