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British Phycological Society Newsletter

Editorial

The winter meeting at Bristol was, by common consent, an unqualified success. There was an excellent turn-out of members, many of whom were also participants in the retirement festivities for Tony Fogg (reported in full in this issue). The programme contained more cyanobacterial papers than usual, thus making a welcome return to the balance of former years. The old argument about the position of cyanobacterial contributions in an algal meeting was always a rather empty one. Perhaps we should take an even more relaxed view of our Society and follow the example of ASPAB by taking more aspects of aquatic botany under our wing.

The editor's prize for correctly identifying the masthead vignette of the Christmas issue was won by Professor T.A. Norton. It was an illustration from The Sea-Side Book by W.H. Harvey (1857). As Professor Norton has also kindly contributed to our new series PHYCOLOGY IN BRITAIN, it is only fitting that this issue's masthead should be a line drawing of his laboratory made, it should be added, in earlier times.

Looking ahead : Please see NEWS AND ANNOUNCEMENTS for plans to hold a special session on economic utilisation of algae at the next winter meeting, which is to be held at the University of Durham. Applied phycologists, please step forward.

Phycology in Britain
I Dundee

The Department of Biological Sciences was formed in 1968, shortly after the establishment of the University of Dundee (formerly Queen's College, Dundee) from the University of St. Andrews. A major research emphasis in phycology was initiated with the appointment of W.D.P. Stewart to the Boyd-Baxter Chair of Biology in the newly-formed Department. The Department has since grown to 23 staff members, and the research interest in aquatic botany has been maintained, with 7 phycologically-orientated biologists, including the appointment of J.A. Raven to a Personal Chair in 1980. Additionally, there are 20 post-graduate students and research assistants working in phycology.

Dundee is ideally suited for aquatic studies with many freshwater lochs and rivers, together with estuarine and marine habitats close at hand. Over the years our research efforts have been supported by all of the major Research Councils, the Royal Society, the Water Research Council and several industries. Additionally, an Agriculture and Food Research Council Research Group on Cyanobacteria (blue-green algae) was created in 1981 employing 6 staff.

Much of the research centres on the physiology, biochemistry, ecology, molecular biology and biotechnological applications of cyanobacteria. Professor Stewart's research interests have focussed on the ability of certain cyanobacteria to fix N_2 following the discovery that the enzyme nitrogenase could reduce C_2H_4 (Stewart et al., 1967 Proc Natl. Acad Sci USA 58: 2071-2078). Subsequent studies into nitrogen cycling and turnover in freshwater algae developed from this together with an interest in nitrogen and carbon assimilation in symbiotic associations. More recently, following a year-long sabbatical he has turned his hand (in part, at least) towards the molecular genetics of cyanobacteria. This complements his established research base in cyanobacterial physiology and biochemistry.

Dr G.A. Codd arrived in Dundee in 1972 and is now Reader in Microbiology, having an active research group working on aspects of cyanobacterial and algal physiology. His group is investigating the toxins produced by several bloom-forming blue-greens including Microcystis aeruginosa, Oscillatoria spp. and Anabaena flos-aquae. Isolates from local lochs and culture collections have been screened for their toxicity to mice and methods have been developed for routine toxicity screening employing antibodies raised against purified toxins and by chemical methods. Other interests include the compartmentation, enzymology and genetics of photosynthesis in cyanobacteria. Carboxysomes have been isolated in his laboratory and have been shown to be major sites of the enzyme ribulose-1,5-bisphosphate carboxylase (RUBISCO). He also has an active research interest in the potential uses and biochemistry/physiology of immobilised microalgae (e.g. Chlorella, Porphyridium).

Dr P. Rowell's interests include the biochemistry and physiology of nitrogen assimilation in free-living and symbiotic cyanobacteria, the light/dark modulation of metabolic activities mediated by thioredoxin, and biotechnological applications of cyanobacteria (through association with Professor Stewart's group). Various enzymes of carbon and nitrogen assimilation (e.g. glutamine synthetase GS, glucose-6-phosphate dehydrogenase) have been purified and extensively characterised. More recently, thioredoxins have been sequenced to permit comparison with known sequences from other prokaryotic and eukaryotic sources. Using colloidal gold coupled to antibodies against purified proteins the localisation and compartmentalisation of certain cyanobacterial proteins has been achieved.

The salt and osmotic responses of algae and cyanobacteria are studied in Dr R.H. Reed's laboratory. Recent research has centred on the role of organic osymolytes in salt stressed blue-greens, using natural abundance ^{13}C nuclear magnetic resonance techniques to identify and quantify the principal low-mole weight solutes in isolates from fresh-water, brackish, marine and hypersaline habitats, with parallel studies on the ionic relations of osmotically-stressed cyanobacteria. Other studies include further investigations on the occurrence and role of the novel hexitol altritol which was discovered in Himanthalia elongata during collaborative research with colleagues in the Dept. of Chemistry. Research is also in progress on the occurrence of the tertiary sulphonium compound B-dimethylsulphoniopropionate and its decomposition products dimethyl sulphide and acrylic acid in marine macroalgae and phytoplankton.

The AFRC Research Group on Cyanobacteria was set up, under the direction of Prof. W.D.P. Stewart, to investigate the molecular biology of cyanobacteria together with their biotechnolgoical applications, particularly the photoproduction of nitrogenous compounds. Dr G.C. Machray, a lecturer in Genetics, is closely allied with the Group, whose research interests include gene transfer in unicellular and filamentous forms of cyanobacteria; directed mutagenesis of nif (nitrogen-fixing) genes; cloning of the Anacystis gln A gene (GS) together with the regulation of expression of Anabaena and Anacystis gln A genes; the sequencing of potential regulatory genes for N_2-fixation and assimilation. Novel approaches are being developed using genetic engineering for the biotechnological uses of cyanobacteria. Together with Dr N.W. Kerby, genetic analysis of mutant strains is under way. Dr N.W. Kerby (a member of the AFRC Group) is involved in other research projects including the immobilisation of photosynthetic microorganisms, reactor design, and the isolation of mutant strains for the photoproduction of nitrogenous compounds. Strains have been obtained which liberate NH_4^+ due to a deficiency in GS activity. More recently, mutants have been isolated which liberate amino acids, utilising the ability of cyanobacteria to fix both carbon and nitrogen. Other interests include the uptake and assimilation of nitrogenous compounds and the NH_4^+ transport system has been extensively characterised in N_2-fixing cyanobacteria.

Microbial interactions with cyanobacteria are studied in Dr M.F.J. Daft's laboratory. Two main areas of research are cyanophage/cyanobacterial relationships, particularly with regard to long term maintenance in nature, and bacterial/cyanobacterial asociations which can be saprophytic or parasitic. Additionally, work is in progress on the production of multiple lytic agents (i.e. bacteria and phages) that lyse nuisance microbes (i.e. blue-greens and green algae).

Professor Raven's phycological research can be grouped under two headings. Firstly, an interest in photolithotrophic growth of algae at low photon flux densities (including the photon costs of "synthetic" and "maintenance" processes) and the influence of organism size on photon costs/photon absorption (the "package effect"). Secondly, research is in progress on aspects of nutrient acquisition (especially inorganic C) by micro- and macroalgae (including the effects of external unstirred layers on nutrient uptake, transmembrane nutrient fluxes, diel acidification/deacidification cycles). The recent publication of his book now provides a comprehensive account of energetics and transport in aquatic plants (the book is of the same title).

Dundee University has shown a strong commitment to phycology over the last 18 years. We hope that this will be maintained in the future, despite the current financial constraints, for the following reasons: firstly, we have published extensively on a broad range of phycological topics (over 250 publications since 1980), secondly we have good collaborative links within the Department and University, and thirdly we have joint research programmes with other institutions in the U.K. and overseas. We are confident that in the future Dundee will maintain its present momentum in phycological research.

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Studies in Experimental Streams

Scientists at the Freshwater Biological Association's River Laboratory in Dorset have been studying the nutrient rich streams of southern Britain in three ways.

1. At first intensive studies were carried out for one or two years at a small number of sites to maximize the amount of information collected.

2. Parallel long-term observations were made on a more limited number of variables, particularly nutrients. These were carried out at many sites to overcome bias introduced from studies of limited duration or location.

3. Finally artificial streams and channels have been used to control directly important variables such as water chemistry and flow which can vary in an unpredictable way in natural streams.

A multidisciplinary team is currently using the third more experimental approach to investigate the factors influencing the interactions between water chemistry and the development of epilithic diatoms and invertebrate populations. Large experimental streams have been built in disused watercress beds in the upper valley of the River Piddle, near Dorchester (National Grid Reference SY 742953) about 15 km from the River Laboratory. In many ways large systems, such as these, simulate natural streams more closely than small channels but to overcome difficulties (and costs) of abstracting and disposing of up to 1 $m^3 s^{-1}$ water a system of recirculation has been devised, with much lower rates of replenishment (0.001 $m^3 s^{-1}$). From the underlying cretaceous limestone (chalk) the site provides a supply of clean ground water, the chemical composition of which is remarkably stable throughout the year.

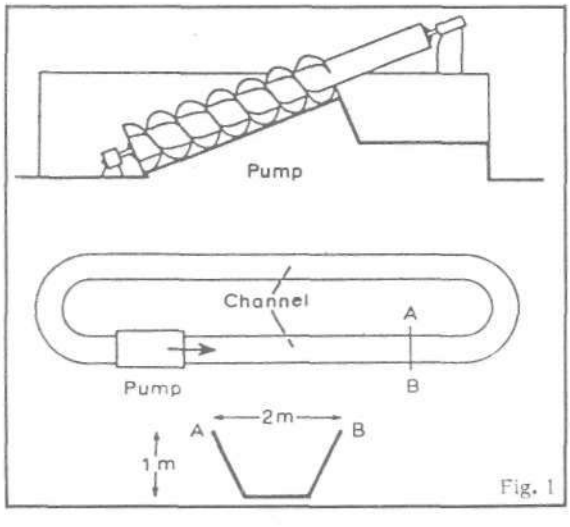

Fig. 1

The artificial streams are made of glass reinforced plastic, trapezoidal shaped in cross section, 2 m wide at the top, 1 m wide at the base and 60 m long round the circumference (Figs 1 and 2). The water is recirculated by a large archimedian screw pump driven by a 3-phase motor. Velocities may be altered by changing the gearing between the motor and the screw and we have run experiments at velocities from 0.15 to 0.45 m s^{-1}. Water is replenished direct from the aquifer at a rate of 3-4 $m^3 h^{-1}$ and an auxiliary pump can boost the rate of replenishment up to 30 $m^3 h^{-1}$. Water leaves the streams from an outflow cut into the side of one of the panels some 50 m downstream from the screw pump. For most of the studies clean gravel from a local quarry was placed in the bottom on the channels to a depth of 30 cm and the depth of water above the gravel varied between 20 cm at the upstream end and 30 cm at the downstream end. Algal inocula were provided from epilithic populations growing in the neighbouring stream, some 15 m away and invertebrate larval populations subsequently developed from the eggs laid by adult insects. Large channels enabled us to carry out an extensive destructive sampling programme to assess accurately changes in the biomass of algae and invertebrates. Daily monitoring on the concentration of nutrients in the inflow and outflow water has also enabled us to relate chemical changes directly to biological processes in a way that is impossible in natural streams. Although much of this work is already published a few examples of the data we have obtained may interest members of the Society who are not aware of our work. Up to 300 fold increases in epilithic

Fig. 2

chlorophyll a (largely diatoms) were observed over two weeks during the colonization phase. Data from Si and ^{14}C uptake suggested production between 50 and 100 g m^{-2} organic carbon over a period of 60 days. For 2-3 weeks Si uptake exceeded 20 g m^{-2} day^{-1} and for a few days exceeded 4 g m^{-2} day^{-1}.

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The Algal Herbarium of Henry Clifton Sorby

Henry Clifton Sorby (1826-1908) was a Victorian gentleman of independent means. Like other illustrious colleagues of the time he chose to devote his life to scientific research. Elected a Fellow of the Royal Society at the age of 31 in 1857 he published over 200 papers during his lifetime showing considerable scholarship and originality in many fields, including Forensic Science, Marine Biology and Archaeology, as well as his well known pioneering work in Geology and Metallurgy. He was, above all, a microscopist developing several techniques in the field of spectrography and becoming president of the Royal Microscopical Society in 1876.

In 1879 at the age of 53, he bought a yacht, a 35 ton yawl, the "Glimpse", and fitted it out as a floating laboratory. In the "Glimpse" Sorby spent every summer for the next 24 years cruising the waters of the south east coast of England studying Marine Biology, Geography, Archaeology, Meteorology and Oceanography. These trips resulted in over 50 scientific papers.

During the winter months Sorby often lectured on his cruises to various learned societies. It was probably during such lectures that the need for better illustrative material led to his idea of preserving marine flora and fauna in such a way as to be used as "lantern" (projection) slides, much as colour photographic transparancies are used today. After much experimentation he perfected the technique which has resulted in this unique herbarium. The herbarium forms part of a much larger collection of marine animals preserved in the same way. The collections are in the keeping of the Sheffield City Museums, which has over 450 preparations of animals and 40 algae and the Zoology Department of the University of Sheffield which has over 500 animals and 5 algae. Thanks to the generosity of Professor Callow, the algal slides held by the Zoology Department are to be transferred to the museum in order to keep the collection together.

The specimens are imbedded in a resin and mounted between two pieces of glass 8.3 cm. square. They are almost completely flat but not distorted in shape, a considerable feat, especially with the animals.

Sorby spent many years experimenting with methods of preserving and staining the organisms as well as softening bone and other hard material and the process of pressing the specimens without distortion often took many weeks for some of the animals. The preparation of the algal slides proved easier than that of animals, though Sorby was initially deterred from mounting them by the belief that the resin would either dissolve out or destroy the colour. It wasn't until 1896 that he tried using Canada balsam and found it perfect, making the algae more transparent as well as preserving the colour.

The late (1896) use of Canada balsam as a mounting medium for the algae may explain the relatively low numbers of algae in the collection compared to the marine animals. The algal collection is made up of 39 specimens from the Rhodophyta, 7 from the Chlorophyta, 6 from the Phaeophyta and 2 which are unidentifiable. Many of the slides have their origin and date on the label in Sorby's own hand. Apart from three specimens all are recorded as, or could have, originated from the coasts of Suffolk, Essex and Kent. One is given as originating from the river Wye and two specimens are not present in lists of algae given in the Victoria County Histories of Suffolk, Essex or Kent, published at the time, and to which Sorby supplied information. These are Codium bursa, dated 1896 but not given an origin, and

Ptilota plumosa which is neither dated nor given an origin. Ptilota plumosa is considered a northern species, yet was recorded from Norfolk at the time. Dictyopteris polypodioides, recorded as being collected from Harwich is unusual for this location and may have been a drifting specimen, though unusual species have been found in this location.

With the use of the slides at both popular and Scientific lectures and Sorby's published descriptions on the technique it is surprising that there are no other collections of this sort in existence (to the author's knowledge). It may be that the technically difficult and time consuming method deterred many people and that the technique did not reach a wide audience until a time when colour photographic techniques for projection slides were rapidly improving. Still, anyone seeing an actual specimen of one of Sorby's slides would recognise it as far superior to any other type of projection slide of the time and the collection provides a unique reference material for taxonomists and ecologists. The collection is in excellent condition showing no signs of colour loss or decomposition; a tribute to the technique.

Thanks to the generosity of Sheffield City Museums, a set of 12 35mm colour slides depicting a selection of Sorby's lantern slides (10 algae and two invertebrates) together with background information is available from Robert Edyvean at the address given below. The price is £7.50 per set (inclusive of p&p) for the UK and Eire, £13.00 or the equivalent in US $ (inclusive of air mail delivery) for the rest of the world. Profits will go to the Scientific Meetings Fund of the Society.

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Phycology in Britain
II Port Erin

The Isle of Man is famous for Manx cats, motorcyle racing and beautiful scenery bordered by majestic, wind-swept cliffs. It is also a major centre for the study of marine algae. The establishment of a permanent Marine Station at Port Erin in 1892 and its subsequent incorporation into the University of Liverpool encouraged intensive phycological studies over a wide range of topics.

Microalgae

In former days when academic salaries were higher, Sir William Herdman roamed the Irish Sea in a succession of private yachts from which he collected plankton. In an extensive series of papers he described the distribution and abundance of various members of the phytoplankton, especially the diatoms (Herdman, 1908, 1910; Herdman & Riddell, 1911, 1912, 1913, 1914; Herdman & Scott, 1908, 1909, 1911, 1912; Herdman et al, 1910, 1913, 1914, 1915). Variations in the vertical distribution of the phytoplankton were investigated (W.A. Herdman, 1921) and both seasonal changes in quantities and variations from year to year were also considered both in large ponds used for fish spawning (Scott, 1924, 1925, 1927) and in the sea (Herdman, 1908, 1909, 1918, 1922; Johnstone et al, 1924). More suitable (if less luxurious) research vessels have allowed the work to continue (Williamson, 1952, 1956a) and we are currently applying statistical methods to explain the distribution patterns of phytoplankton.

Classic studies of sand-dwelling dinoflagellates were also carried out by Herdman and his daughter (Herdman, 1911, 1912, 1921, 1922, 1924a, b). The photosynthesis of psammophytic Amphidinium herdmaniae at various salinities was investigated by Bruce (1925).

The distribution of chlorophyll a in the Irish Sea has been related to nutrient availability, temperature stratification of the water and the distribution of zooplankton (Khan & Williamson, 1970; Slinn, 1974; Slinn & Eastham, 1984). The phytoplankton have also been used as indicators of patterns of water flow in the region (Williamson 1956b). The effects of algal photosynthesis on the pH of the water was investigated by Moore et al, 1914.

The cultivation of planktonic flagellates as food for oyster larvae (Bruce et al, 1939) led to Dr M. Parke's life-long interest in microalgae. Several species of Haptophyceae and other flagellates collected from just off Port Erin were new to science and these have been described by Parke (1949) and Parke et al (1955).

Our current work is concerned with algal production in relation to grazer requirements, and the effects of heavy metal pollution on selected flagellates.

Seaweeds

Lists of seaweed species from the Island have appeared since the mid 19th century and these efforts culminated in the publication of a classic work of British phycology, Manx Algae by Knight and Parke, in 1931. Subsequently a few supplementary distribution records have appeared (Park, 1932, 1933a, 1934, 1935, 1940; Lodge, 1950a, b, 1954a; Walker et al, 1954). A number of species new to the British Isles were described in these publications as well as the first record of laminarian gametophytes from nature (Parke, 1932). The spectrum of life forms in the Manx seaweed flora has been compared with those in other geographical regions (Garbary, 1976).

Systematics, development and reproduction
Studies of varying intensity have been carried out on Manx specimens of Enteromorpha (Burrows, 1959); Monostroma (Wilkinson & Burrows, 1972a); Alaria (Lewis, 1970; Walton, 1986); Asperococcus (Knight et al, 1935); Acrothrix, Chordaria, Cladosiphon (Parke, 1933b); Chorda (South & Burrows, 1967); Desmarestia (Chapman & Burrows, 1970, 1971); Dictyota, (Russell, 1970); Ectocarpus (Russell, 1966a, 1967a); Eudesme (Parke, 1933b); Fucus (Burrows, 1955; Knight & Parke, 1950); Halopteris (Mathias, 1935b); Himanthalia (Gibb, 1937); Laminaria (Kain, 1964, 1965, 1975b, 1976b; Svendsen & Kain, 1971); Laminariocolax (Russell, 1964b); Mesogloia, Myriocladia (Parke, 1933b); Pelvetia (Subrahmanyan, 1956, 1957a, b); Pilayella (Knight, 1923; Russell, 1964a); Saccorhiza (Norton & Burrows, 1969a); Sauveaugloia (Parke, 1933b); Sphacelaria (Clint, 1927); Stictyosiphon (Mathias, 1935a); Tilopteris (Lodge, 1949a); Ahnfeltia (Russell, 1985); Callithamnion (Mathias, 1928); Callophyllis (Kain, 1982, 1986a); Ceramium (Garbary, 1979; van Tussenbroek, 1985); Chondrus (Darbishire, 1902); Cruoria, Cryptopleura, Delesseria (Kain, 1982, 1984b, 1986a); Dumontia (Lodge, 1949a); Fosliella (Adey & Adey, 1973); Furcellaria (Russell, 1985); Gelidium (Dixon, 1962); Lithophyllum, Lithothamnium, Mesophyllum (Adey & Adey, 1973); Membranoptera, Odonthalia, Palmaria, Phycodrys, Plocamium (Kain, 1982, 1984a, 1986a); Phymatolithon (Adey & Adey, 1973); Plumaria, Porphyra (van Tussenbroek, 1985); Polysiphonia (Lawson & Russell, 1967); Pterocladia, (Dixon, 1958); Ptilothamnion (Dixon, 1962); Ptilota, Rhodomela (van Tussenbroek, 1985) and Tenerea (Adey & Adey, 1973).

Intertidal ecology

The rich and varied intertidal flora on Manx shores has attracted many ecologists and the zonation and abundance of littoral seaweeds have been described from several sites (Knight & Parke, 1950; Gibb, 1938; Southward, 1953; Russell, 1966b, 1973, 1977; Hawkins & Hartnoll, 1980). Some accounts deal with the plants inhabiting rather specialized habitats such as within shells (Parke & Moore, 1935; Wilkinson & Burrows, 1972a, b), on floating buoys (Lodge, 1949b) and in seawater storage tanks (Judges & Southward, 1953).
Phytosociological and statistical methods have been applied to some populations by Russell (1973, 1977) and Hawkins and Hartnoll (1980). Seasonal and other changes in the plants have also been described (Knight & Parke, 1931; Lodge, 1949a; Hartnoll & Hawkins, 1980; Hawkins & Hartnoll, 1983a).

Fucoid algae blanket many shores and have been the focus of much research. Knight (1947), Knight and Parke (1950) and Subrahmanyan (1961) produced comprehensive accounts of the seasonal growth and reproduction of Fucus serratus, F. spiralis and F. vesiculosus. Both

Burrows (1955) and Russell (1978) have compared the growth, morphology and anatomy of Fucus plants exposed to different degrees of wave action. Current research is attempting to determine the physical properties possessed by thalli that survive the waves (Young & Norton, 1986). The effects of reduced salinity have also been investigted for F. spiralis and F. ceranoides (Khafaji & Norton, 1979) as well as for Pilayella littoralis (Russell, 1963). The occurrence and ecological significance of possible hybrids between species of Fucus has also been discussed (Burrows & Lodge 1951, 1953). Moore et al (1922) investigated the photosynthesis of F. serratus.

Other fucoids that have been subjected to ecological investigations include Himanthalia elongata (Gibb, 1937; Russell & Veltkamp, 1984) and Pelvetia canaliculata (Subrahmanyan, 1960; Kremer, 1976; Rugg & Norton, 1986).

Climatic conditions periodically prune back the upper limits of many intertidal algae (Hawkins & Hartnoll, 1985) and physical conditions as well as biotic factors may limit the downward extension of Pelvetia canaliculata. In the latter case pathogenic agents and even an endobiotic fungus may be implicated (Rugg & Norton, 1986).

Much of our appreciation of the influence of biotic factors on the distribution on seaweeds stems from the removal of limpets from a strip of shore 10 m wide and 115 m long by N.S. Jones in 1946. The dramatic development of seaweeds that resulted was carefully monitored (Jones, 1948; Lodge, 1948b; Burrows & Lodge, 1951 and Southward, 1956, 1964). These observations established for the first time that limpets can control the abundance of intertidal algae and if sufficiently abundant can keep the shore virtually devoid of seaweeds. Moreover, it became clear that in the absence of excessive interspecific competition, algal species were able to survive, even thrive, over a much greater vertical range than they normally occupied. Further complex and subtle interactions between fucoid algae, limpets and barnacles were subsequently revealed (Burrows & Lodge, 1950; Southward, 1956; Hawkins, 1981a, b), and the energy budget of limpets was calculated (Wright, 1977). Competition between subsidiary members of the algal vegetation have also been investigated (Russell and Fielding, 1974). Many of these biotic interactions have been reviewed by Hawkins & Hart (1983b) and have been incorporated in a model of the zonation of seaweeds on rocky shores (Norton et al., 1986).

Subtidal ecology

Even before the advent of the aqualung, subtidal algae were studied from drift specimens (Knight & Parke, 1931), or collected by means of grapnels or grabs (Lodge, 1954b; Burrows, 1958). Initially surveys of underwater seaweed communities in relation to depth and seasonal factors were conducted on unstable substrata (Burrows, 1958), and the consequences of being unattached are discussed by both Burrows (1958) and Russell (1967a, b). With the appointment of Dr J.M. Kain to the Marine Station in 1956, diving became a routine occurrence and it has since grown to become a major activity of the Department.

Kain (1960) described the communities on stable and subtidal rocky substrata and analysed some of them statistically (Prentice & Kain, 1976). The dynamic changes that follow removal of the plants were also observed in detail (Kain, 1975a, 1976a).

Much of Dr Kain's early work was concentrated on the dominant forest-forming plant, Laminaria hyperborea. An extensive series of papers dealt with the development of the early stages (Kain, 1964, 1965), the vertical distribution of the adult plants (Kain, 1962) and the structure of the forest (Kain, 1963, 1967, 1971a, 1977). The effects of light were studied extensively (Kain, 1966, 1971b; Kain et al., 1976), and the availability of a suitable substratum, and grazing echinoderms were also found to be very influential (Jones & Kain, 1967; Vost, 1983). The depredations of Patina were also studied (Kain, 1963; Kain & Svendsen, 1969). A detailed summary of much of this work is given by Kain (1971c, 1979).

Dr E.M. Burrows and her students from the Department of Botany carried out parallel studies on the other major subtidal brown algae including Laminaria saccharina (Burrows, 1961); Chorda filum (South & Burrows, 1967; Norton & South, 1969); Saccorhiza polyschides (Norton, 1969, 1970, 1977; Norton & Burrows, 1969a, b; Norton & South, 1969); Desmarestia aculeata (Chapman & Burrows 1970, 1971) and Alaria esculenta (Lewis, 1970). Kain (1969) also compared the relative competitive abilities of several species of laminarians in relation to different levels of irradiance and water temperature.

A recent development from this work is the large-scale cultivation of kelp plants on an underwater 'farm' in the sea (Dawes, 1986; Holt & Kain, 1983; Jones & Holt, 1981; Kain & Holt, 1982, 1984). The plants most amenable to cultivation are Alaria esculenta and Laminaria saccharina. Sacchoriza polyschides grew well, but was easily dislodged and had a low organic content (Jensen et al (1985).

Numerous investigations have also been carried out on the seaweeds living beneath the laminarian canopy. Moore et al examined their photosynthesis and Kain (1982, 1984b, 1986a) has quantified the seasonal growth and reproduction of several species. Plants epiphytic on the kelp have also been studied (Norton and Burrows, 1969a; Chapman, 1969; Harkin, 1981a, b; Russell, 1983; Hawkins and Harkin, 1985). Canopy removal induces dramatic changes in the understorey vegetation (Harkin, 1981b; Hawkins & Harkin 1985). It is clearly kept in check by the shade cast by the overlying canopy of Laminaria (Harkin 1981a, b); and by grazing echinoderms (Vost, 1983). Work is continuing on the effects of photoperiod on the understorey species Delesseria sanguinea and on the seasonal development of Plocamium cartilagineum (Kain, 1986b). In no other region of the world has such intensive ecological work been carried out on such a variety of subtidal algae.

Pollution studies

The relatively clean waters surrounding the Isle of Man are not ideal for studying pollution effects in the sea, but this has not hampered laboratory based experimentation. The effects of a wide variety of chemical pollutants have been studied with Ulva lactuca (Burrows, 1971), Laminaria saccharina (Burrows & Pybus, 1971; Burrows, 1971; Pybus, 1971, 1973) and Laminaria hyperborea (Hopkin & Kain, 1971, 1978). The accumulation of radioactivity in Fucus vesiculosus has also been investigated by Thompson et al (1982).

Recently our attention has turned to the effects of oil pollution which have been studied both in the laboratory and in enclosures in the sea (Grandy, 1984a, b). Currently we are investigating the value of Palmaria palmata plants as indicators of oil pollution.

Liverpool University now boasts more phycologists than any other University in Britain. This strength should ensure that phycology and especially students of algal ecology will continue to flourish off the shores of the Isle of Man.

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(Details of the references cited in this article are obtainable from the editor.)

Urchin '86

We still seem to take our rotund and spiky friend, the sea urchin, for granted. Even though it is one of our most distinctive species we are only just beginning to realise the crucial role that the urchin plays in the underwater environment. Urchins are the sheep of the sea. They graze surfaces bare of weeds and animals and create space for new colonisers which, in turn, helps to keep the balance of nature in the shallow seas around our coasts.

The large size of the sea urchin and its colourful shell is leading to its downfall. Off Cornwall alone, between

250,000 and 500,000 urchins are collected each year to supply the curio trade.

URCHIN '86 is a nationwide project which aims, in one year, to collect information on the status of the urchin populations from all around the coast of the British Isles. We need you and your diving club or diving group to help us to achieve that goal.

The project is in two parts:

Part One is for individuals:
Simply complete a preprinted postcard after your dive saying whether you saw any urchins and, if so, how many. We are particularly interested to know about the areas where there are no records from the last survey (see map). Are there really no sea urchins there? We need at least 500 divers to take part. Will you help? Send for your postcards and instructions now!

Part Two is for groups:
This part of the project looks in detail at those areas where there are urchins and involves counting and measuring urchins, laying lines and good dive organisation! We need at least 20 groups to carry out this part of the project. Will your club or group be able to help?

For further details on URCHIN '86 please write to the Marine Conservation Society, URCHIN '86, 4 Glocuester Road, Ross-on-Wye, Herefordshire HR9 5BU.

Communicated by W. Farnham, Marine Laboratory, Portsmouth Polytechnic, Ferry Road, Hayling Island, PO11 ODG, England.

Conference Reports

MSC Projects and Conservation Workshop, Reading University - February 1st and 2nd 1986

This interesting workshop was held by the Marine Conservation Society in order to discuss a variety of topics relating to conservation and MCS projects. Speakers introduced and chaired sessions on 'Coastwatch' (Teresa Bennett); assessing the conservation value of the coast (Roger Mitchell); 'Urchin' '86 (Gill Bishop); monitoring projects (Keith Hiscock); turbidity (Chris Lumb); the Coastal Directory (Susan Gubbay); and wardening coastal reserves (Paul Pritchard and Paul Milmour). Of interest to phycologists were contributions by Sue Hiscock in the sessions on turbidity and monitoring. The possibility of monitoring changes in turbidity using the lower limits of marine macroalgae (kelps and smaller foliose algae) was discussed, and information on the depth penetration of various species presented using the results from Nature Conservancy Council funded surveys in various parts of the British Isles (Scillies, Milford Haven, Skomer and Loch Sween). Some factors other than turbidity affecting the lower limits of macroalgae were explored. Information on the seasonal changes in algal species and abundance near the lower limits of macroalgae on Skomer was presented. In the monitoring session, the seasonal aspect was explored further, and some results from the first year's monitoring of algal populations at various depths on Skomer given. These showed considerable changes in abundance and condition throughout the year, especially on unstable substrata (pebbles). Some of the practical aspects of monitoring sublittoral populations throughout the year were also mentioned.

Information on MSC projects and the Society in general is available from The Marine Conservation Society, 4 Gloucester Road, Ross-on-Wye, HR9 5BU. Tel: (0989) 66017.

Sue Hiscock, Gut View, 8 Stranraer Avenue, Pennar, Pembroke Dock, Dyfed SA72 6SD, Wales.

Chalk and all that

For those of us interested in algae that elaborate themselves with calcium carbonate and other mineral substances, the Symposium on "Biomineralization in lower plants and animals", organized by Drs Barry Leadbeater and Robert Riding gave us a most valuable five days at the University of Birmingham from 15-19 April 1985. Mineralization of all types was considered, among the more unusual being the extra-cellular accretion of the oxalates of calcium, copper and magnesium by lichens. By far the most common minerals to occur, however, are calcium carbonate (e.g. coccolithophorids, green and red algae; Foraminifera) and Silica (e.g. diatoms, Chrysophyceae, Choanoflagellates). Mineralization can either occur within organisms, or structures formed internally can be extruded to form extravangantly shaped and patterned scales, spines and "cages"; the strangeness of many of these far exceeds one's wildest imagination.

Mineralized organisms play an important role in the earth's productivity and have contributed on a huge scale to its geology and resources. Nevertheless despite all the research that has gone into the mineralization process, there are still many questions to be answered concerning the "whys" and "hows". A Symposium such as this, in cutting across traditional taxonomic boundaries, afforded the participants valuable new insights and will surely stimulate new lines of enquiry.

Keynote papers will be published in the Special Volume Series of the Systematics Association.

Members who are interested in mineralized organisms may like to know of two newsletters - both distributed without charge! -

> Biomineralization Newsletter (New Series) - this is being edited in Japan but information is available from Professor Kenneth Simkiss, Department of Zoology, University of Reading, Whiteknights, Reading, RG6 2AJ, U.K.
>
> Coralline News, edited by Yvonne Chamberlain, Marine Laboratory, Portsmouth Polytechnic, Ferry Road, Hayling Island, PO11 ODG, U.K.

The editors will be pleased to send these newsletters to anyone with any interest, specialized or general, in mineralized organisms.

Yvonne Chamberlain

Letters to the Editor

Dear Sir

In view of my interest in the origin and evolution of chloroplasts, I am in search of the following books:

Wallin, I.E. (1927) "Symbionticism and the origin of species" - Bailliere, Tindall & Cox (London).

The book is not available from any library in The Netherlands, and the publisher's archives were destroyed during the war.

So I would be much obliged to get a (photo)copy of the Wallin book. If somebody can help me, please inform me about the costs beforehand,

Yours sincerely

H.H. van der Velde, Stuyvesantstraat 95 zwart
2023 KM HAARLEM, Netherlands

Dear Dr Russell

Maybe it will be of interest to the Readers of the British Phycological Society Newsletter to be informed of the recent foundation of the "Dutch-Flemmish Circle of Diatomists".

To this society about 50 professional and amateur diatomists are affiliated.

An important aim of this society is to promote contacts between diatomists at home and abroad.

As far as we ascertain the diatomists-society is unique for the low countries.

The secretary address: Geological Survey of the Netherlands, P.O. Box 157, 2000 AD, Haarlem, The Netherlands.

With kind regards, sincerely,

Dr Pieter M. Houpt, (Chairman), Timorstraat 119, 2585 SE The Hague, Netherlands.

The Retirement of Professor G.E. Fogg, F.R.S.

G.E. Fogg, who embarked on his phycological career in 1940 as a research student of F.E. Fritsch, retired in July last year from the Chair of Marine Biology at U.C.N.W. The occasion was marked by a reunion dinner attended by many of his past research students and research associates, held at the Mauretania restaurant in Bristol after the Winter Meeting of the British Phycological Society.

Many of Professor Fogg's students, numbering about 50 in all, are still engaged in phycological pursuits and the scientific meeting provided a focus for the reunion, especially for those who travelled from abroad, from as far away as Nigeria, Brazil and California, to be with us. Fogg students have played a prominent part in the Society over the last three decades, several have served on Council and some have occupied the position of president, secretary, treasurer and editor of the Journal. Thirty nine of us, including Tony and his wife Beryl, sat down to dinner.

After the dinner, letters were read from absent colleagues sending their good wishes, and recollections. Professor Fogg replied with some of his own memories. He recalled his days as a student and the influences that shaped his career. He remembered first F.E. Fritsch at Queen Mary College who seemed to eschew complex apparatus and assembled his encyclopaedic knowledge of phycology aided by little more than scissors and paste, the tools with which the celebrated Fritsch collection was put together. The move of QMC to Cambridge in the war brought Fogg into contact with F.F. Blackman, the plant physiologist, and G.E. Briggs, from whom he learnt the power of simple quantitative analyses in the solution of biological problems.

Fogg's postgraduate studies (in which he made notable discoveries on nitrogen fixation by blue-green algae) were followed by a survey of seaweed resources of the British Isles for the Ministry of Supply undertaken in the company of R.A. Lewin and V.J. Chapman. After the war Fogg joined the staff of the Department of Botany at University College London; he recalled the influence of W.H. Pearsall, with his ability of drawing broad principles from a wide range of information. Fogg was appointed to the Chair of Botany at Westfield College London in 1960, where he formed a large group of algal physiologists specialising in blue-green algae and extracellular production. In 1971 he moved to the Chair of Marine Biology at the Marine Science Laboratories of the University College of North Wales, Menai Bridge.

The reunion dinner ended with everyone joining in with a grand retelling of memories of the various laboratories, not always accurately remembered but nevertheless greatly enjoyed. G.E. Fogg's success, not just as a scientist but also as a teacher, could have received no better testament than the gathering together of so many of his successful students. As he contemplates his next period, official retirement, to be spent at first in writing a treatise in Antarctic research he might like to glance back on the lexicon of his achievements compiled by one of his first colleagues, Ralph Lewin*.

Those attending the re-union:

I From UCL days: Gerald & Shirley Boalch, Peter Fay, Joanna Jones (nee Kain), Alan Miller, John Millbank, Jack Talling, Noni Tiffany (nee Adams), John (& Jac) Westlake, Brian Whitton. II From Westfield days: Ron Bishop, Rosalie (& Dennis) Brown (nee Cox), Dicky Clymo, Slim Dinsdale, Matthew Dring, Alex (& Marci) Horne, Keith Jones, Arthur Marker, Freddy Opute, E. Paasche, Jorges Parades, Howard Pearson, Annette Pipe, Bill Stewart, Brenda Thake, Tony (& Fausta) Walsby. III From Menai Bridge days: Paul (& Jo) Hayes, Karen Lochte, Dave Mills, Allan Pentecost, Kathi Richardson, Carol Turley.

A.E. Walsby, Department of Botany, University of Bristol, Woodland Road, Bristol BS8 1UG, England.

Address to Tony Fogg
by
Ralph Lewin

A is of course Anabaena, bacterial cyanophyte;
And D is the drink or the dinner that brings us together tonight.
GEF stands for the fellow we honour with love and respect,
And H is the heterocyst, now / renowned after years of neglect.
There's I for the intellect lucent, and J for the jocular mien,
While K is his constant attention to problems of algae blue-green.
L stands for the light, at a level that serves to encourage their growth,
And M for the nutrient medium - one really must optimize both.
Some nitrogen atoms are captured when oxygen's not in excess,
And P's the path photosynthetic where algae are such a success.
Q is Queen Mary's fair college: RS for the Royal Society;
And T is for Tony, a nickname of doubtful but ancient propriety.
One turns to UV radiation when picking of filaments fails;
And W stands for waves, water, and places like Westfield and Wales.
XY are the functions that alter, while Z's the implacable zest
Sustained when experiments falter or students are put to the test.

This still leaves a lot of involvement - He'd say, if you ask him, "Too much!"
There's A for Antarctic assignments: BC British Council and such.
D stands for the gamut of duties directors have always to do,
With extracurricular roles at / the FBA, RC and Kew.
Now F is perhaps for the fencing (surrounding an elegant garden)
While H is the hair that grows thinner as one or two arteries harden.

And lastly, I offer this postscript, before your attention grows tired.
He's always been somewhat retiring. Now, finally, has he retired?

*The author (and subject) of this poem have kindly permitted its publication in the Newsletter : Editor.

News and Announcements

News from The Colonies

Those who are interested in marine algal population studies will be pleased to learn that Bob Wilce and his colleagues (Andrew Davis, Steven Millar and Marshall Pregnall) at Amherst are continuing their research on the unattached Pilayella, which fouls several New England beaches (Phycologia, 21 (3), 1982). Present work is directed mainly on the growth characteristics, nutrient uptake and genetics of this unusual population.

Bob's arctic interests continue to be active, however, with a return visit planned for September in the company of Bob Vadas and Steven Miller.

Communicated by R. Wilce, University of Massachusetts at Amherst, Morrill Science Center, Amherst, MA 01003, U.S.A.

Honorary Degree for Dr M.W. Parke, F.R.S.

All members will be delighted to learn that the University of Liverpool is to confer the honorary degree of Doctor of Science upon Dr Parke to whom we send our warmest congratulations : Editor

Progress in Algal Taxonomy

An International Symposium on this topic is to be held under the auspices of the Slovak Academy of Sciences at Smolenice, Czechoslovakia from June 15 to 19, 1987. This meeting will provide a rare opportunity for western phycologists to exchange views and establish personal contacts with eastern european colleagues.
The scientific programme comprises three sections: 1 General problems in algal taxonomy (Convener H. Ettl); 2 Taxonomy of individual groups of algae, including a special workshop on green algal taxonomy (Convener J. Komarek); 3 Modern methods of taxonomic evaluation, including numerical, statistical, computational and graphical methods (Convener P. Marvan). Copies of the First Circular and other details are obtainable from Dr. F. Hindak, Chairman of the Organizing Committee, Institute of Experimental Biology and Ecology, Slovak Akademy of Sciences, Dubravska cesta 14, CS-814 34 Bratislava, Czechoslovakia.

Communicated by H.J. Sluiman, Rijksherbarium, Postbus 9514, 2300 RA Leiden, Netherlands.

BPS Field Meeting

It has always been a matter of great regret to me that the annual BPS summer field meeting (?holiday) lapsed before I had the chance to go on one. Although my work takes me on algal surveys in the field for most of the summer and I am familiar with most of the British marine macroalgae, it's quite amazing how much more I learnt with an expert on little brown jobs (LBJ's) or red crusts nearby. The opportunity to tap the wealth of expertise in the society is one which I personally would welcome, plus of course the opportunity to get to know one's fellow society members better. After a long period with no field meetings, I and some other council members think that perhaps it is time for a revival. Would anyone be interested, for instance, in a field meeting in South Pembrokeshire in August 1987, based at either Orielton or Dale Fort Field Centres? If there is enough response, I would be willing to organise a field trip at one of these centres. Centre weeks start on Wednesday, and there are the usual basic lab. and wet bench facilities. Single centre accommodation is limited, but there are plenty of local bed and breakfast places and hotels if preferred. Approximate costs for a week would be around £130, with extra for trips to Skomer and/or Grassholm. As an added carrot, the centres have diving facilities for those who can, and we could arrange collection of sublittoral specimens for those who can't. Of course I think 'marine', but we have a variety of freshwater and brackish habitats within easy reach as well. If you are interested, please write to me at the address below.

Sue Hiscock, Gut View, 8 Stranraer Avenue, Penmar, Pembroke Dock, Dyfed SA72 6SD, Wales.

That LOGO again!

Every self-respecting society has a LOGO - except us! Last year we tried to establish one by inviting members to contribute designs. Unfortunately very few were received, paprtly because of a rather tight deadline, and as we know there is lots of hidden talen amongst you, we want to have another go. Of course the LOGO has to be the right one, and chosen in a democratic manner by the membership. What we want is as many designs as possible by the deadline for the next newsletter, so the designs can be circulated with the newsletter (anonymously - so don't be shy!). We hope you will then vote for the one you like best. So get doodling - as many designs as you can think of to me as soon as possible!

Sue Hiscock.

The Current and Potential Economic Utilisation of Algae

At the next annual meeting of the British Phycological Society in Durham it is proposed to hold a special session on "The Current and Potential Economic Utilisation of Algae".

Anyone wishing to contribute a paper to this session should write to either Professor Gerry Blunden, School of Pharmacy, Portsmouth Polytechnic, King Henry I Street, Portsmouth PO1 2DZ or Dr Nigel Kerby, University of Dundee, Department of Biological Sciences, Dundee DD1 4HN.

Contributions already received include:

"Problems associated with the microbial contamination of seaweeds used for human and animal consumption"

"The alleviation of salt stress produced by constituents of commercial seaweed extracts as assessed by the Klebsiella pneumoniae bioassay"

"The uses of algal lectins as diagnostic reagents"

"Waste treatment by algal culture"

"Algal biosensors"

"Algal immobilization for biotechnology"

Editorial address **G. Russell, Department of Botany, The University, Liverpool L69 3BX, England.**

N.B. COPY FOR INCLUSION IN NEXT ISSUE MUST REACH THE EDITOR BY OCTOBER 1st 1986

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