

The PHYCOLOGIST



The Newsletter of the British Phycological Society

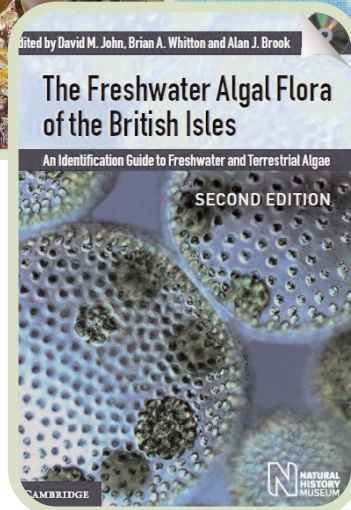
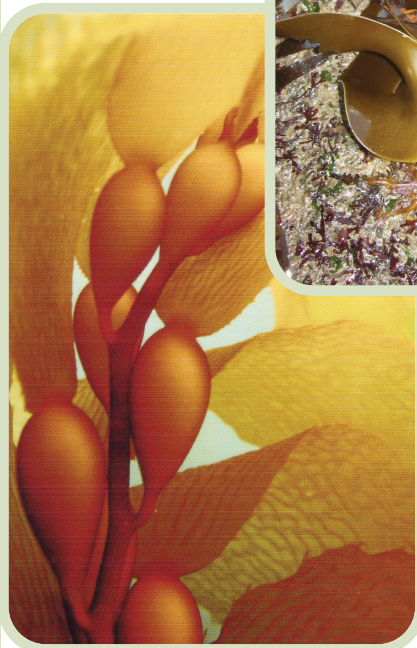
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Spring 2011

Review of the 59th Annual Winter Meeting
Hilda Canter-Lund Photography Award
Reflections of 60 yrs of Phycology and the BPS
BPS AGM minutes



2011 British Psychological Society

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Editorial

Like the first sign of spring, snowdrops and crocuses bursting with colour, the Spring edition is here! This edition is jam-packed with reviews of the 59th Annual Winter Meeting including the BPS AGM minutes and Annual report and Financial Statement, an introduction from the new student representative, details of the Manton Prize AND Student Poster winners, Student Bursary Reports, the 2010 Hilda Canter-Lund Photography Award winner, and reflections of 60 years of Phycology and the BPS by past BPS Presidents and overseas vice Presidents... and much more.

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Sadly, the BPS lost two members recently - one of the Honorary Life Members, Professor Frank Round and Dr Yvette Berger.

BPS Council proposed to make two new Honorary Members in recognition of their work for the Society - Harry Powell, as first secretary of the Society when it was founded in 1952, and Professor Michael Guiry, for his lifelong work in phycology and his continued and much valued support of the Society. Congratulations.

Please remember to renew your membership for 2011 and update your membership and contact details.

Remember - do keep sending in your contributions. Write to us with your phycological views, news, work events, or any matter you wish to share with readers of *The Phycologist*. YOUR input is required; all relevant material will be considered (job adverts, science reports, book reviews, news items of topical interest, meeting announcements, research news, and suggestions for future articles are always welcome). Without YOU the newsletter would not exist.

As a reminder, previous issues of *The Phycologist* can be downloaded at <http://www.brphycsoc.org/phycologist.lasso>.

Front cover images:

Laminaria hyperborea.

Apical tip of the giant kelp *Macrocystis pyrifera*. Erasmio Macaya, Hilda Canter-Lund photography Award 2010 winner.

Vampyrella lateritia ingesting the protoplast of *Zygnema* sp. Sebastian Hess.

Freshwater Algal Flora of the British Isles, 2nd edition. Publication expected May 2011.

Membership updates

Important changes to online access of the European Journal of Phycology and payment methods are detailed.

Dear BPS Members

It was good to see so many of you at the Annual Winter Meeting in Cardiff. As I reported at the AGM we have been working towards changing the way you access the *European Journal of Phycology* (EJP) online. Thanks to the efforts of our Webmaster team Mike and Caoilte Guiry and the team at Taylor and Francis we have transferred online access from the informaworld platform to direct access from the BPS database. Those of you who subscribe to the journal will now be able to access the EJP by simply going to <http://www.brphycsoc.org/ejp/> and entering your e-mail address and password. If you have forgotten your password please enter your e-mail address in the box under 'Forgot your Password?' (<https://www.brphycsoc.org/login.lasso>); click Remind Me and your password will then be sent to your e-mail address.

If you have renewed your membership for 2011 you will be redirected to the Taylor and Francis website, where you will have full access to the EJP. If you have not renewed for 2011 (or you do not subscribe to the journal) you will not be granted permission to access the EJP. We are still accepting renewals for 2011 so if you have yet to update your membership please do so now!

Thank you to those of you who have renewed for 2011, PayPal is now fully operational and is a great way for you to pay. You do not

need a PayPal account, the payment is instant and you have the additional peace of mind as each transaction is completely secure and guaranteed by PayPal. From April 2011 you will no longer be able to pay online using the BPS payment form, as due to increasing costs, we are not renewing the website security. For those of you who do not wish to use PayPal you can still enter your credit/debit card details on the postal application/renewal form or send a cheque payable to the British Phycological Society to me at the address below.

Finally there are still many contact details in the database that are incorrect - this causes us to receive postal returns from both *The Phycologist* and the EJP and also from e-mail announcements. Can I please ask all members to check their contact details and ensure they are up-to-date - this can be easily done by logging into your membership record in the database:

<http://www.brphycsoc.org/membership/>

If anyone has any questions or queries relating to their membership please do not hesitate to contact me using the contact details below.

Dr. Sara Marsham
BPS Membership Secretary
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Review of the 59th BPS Annual Winter Meeting

The 59th Annual Winter meeting (5th - 7th January 2011) was held in South Wales in the Cardiff Thistle Hotel, organised by our man on the spot, Rupert Perkins. In addition to successfully negotiating preferential rates for delegates staying in the hotel he also managed to arrange for reasonable weather after the snow which hit Britain in December. In the rest of Europe a similar amount of snow barely arouses a raised eyebrow but here it causes chaos and disruption and brought parts of the country to a standstill. It seemed as though the BPS 2011 Winter Meeting would be a repeat of the 2010 Oban conference. Fortunately things improved. The sun may shine on the righteous but we were happy to settle for grey skies and rain which were more than adequately compensated for by the stimulating presentations, posters and discussions.

Professor Graham Hutchings, Pro Vice Chancellor for Research at Cardiff University, welcomed the BPS to Cardiff and the meeting began with a special session on Phagotrophy in the Evolution and Ecology of Algae which John Raven chaired and presented the first paper. Five half hour talks got the meeting off to a good start followed by the evening poster session where there were posters detailing research including algal ecology; the effects of climate change on diatom distribution, and of ocean acidification on coralline algae; interactions between algae and other groups - viruses, sponges and copepods; invasive algal species and algal cultivation. These provided a stimulus for conversation and exchange of ideas over a glass of wine and a bite of cheese. Thursday morning began with special session two on The Phycology of Estuaries, Barrages and Lagoons chaired by Martin Wilkinson in which he also presented a paper. The President's Address, with the intriguing title "Stardust and a Story of Phycological Enlightenment", was given by Juliet Brodie in which she reviewed the science (or art?) of systematics from 6000BC to the present day with a look into the future of phylogenetics, ending with the provocative statement "Let's get rid of species". Ralph Lewin thirty years ago concluded that as knowledge grows the concepts of taxonomic species, biological species and nominal species will correspond ever more closely - even if it can

never be fully achieved (Lewin, R.A. 1981 Three species concepts *Taxon* 30: 609-613). It looks like this is a debate which will run and run especially as there are so many definitions of "species" to include. On Thursday afternoon there were parallel sessions chaired by Rupert Perkins and Francis Bunker so there was the usual movement between sessions as delegates chose from the programme of talks. John Bothwell kindly stepped in at the last minute and volunteered to give a talk when one of the timetabled speakers was unable to get to the conference. Note to future conference organisers - make sure John is a delegate!

The dinner on Thursday evening was at the Madeira Restaurant serving Portuguese food. The atmosphere was loud and lively. Other diners who had gone out for a quiet or romantic evening will have been disappointed. Rupert manfully walked from table to table (of BPS members!) to ask the quiz questions - quite a difficult task given the seating arrangements in the long, narrow dining area. I happened to be on the winning team - by good luck and no thanks to me. Council members should have got one question right because Jan helpfully included the answer in his report as Editor of *The Phycologist* - the name (spelt correctly) of the Icelandic volcano which erupted in 2010. I'm not sure anyone got that right. Hint to Council - if you attend future annual meetings read the reports of officers very carefully!

The Manton Session, chaired by Juliet Brodie, was held on the last day of the conference. Eleven interesting presentations gave the judges of the Manton Prize something of a headache in deciding the winner. This was followed by the announcement of the winner of the Hilda Canter Lund Photography Award. Martyn Kelly outlined the history of the prize and showed all the shortlisted images before announcing the 2010 winner - Dr Erasmo Macaya, for his image of *Macrocystis pyrifera*.

Eileen Cox then gave a very moving personal tribute to Frank Round who died in October 2010, into which she skilfully wove contributions from many others whose lives and careers he had



influenced. Two parallel sessions followed, chaired by Graham Underwood and Stephen Maberley. Rupert, not content with organising the Winter Meeting, chairing a session and acting as quizmaster, allocated the last slot to himself and ended the conference with a talk about the photophysiology of stromatolite microbial communities. Taylor and Frances provided the student lecture "Getting Published". The AGM was well attended - presumably there is nothing to do in Cardiff on a wet Friday afternoon? In my report as Secretary I usually say that normal secretarial duties have been carried out but this year I was able to include details of an unusual request I received from a Channel 4 researcher who asked if I could supply some seaweed for a television chef. The chef in question was Heston Blumenthal who was developing a tasting menu which included a course called Sound of the Sea, during which the diner eats smoked fish, edible "sand" and "seaweed" while listening to seagulls on an iPod. I duly despatched a box of seaweed to The Experimental Kitchen at The Fat Duck at Bray - much to the astonishment of the woman in our local post office. Juliet had said that she wanted to raise the profile of phycology although this may not have been what she had in mind.

Heston must have similar views to Juliet on the species issue because he only wanted seaweed - species immaterial, although I did include a list of the species in the box just in case he is an adherent of Species Concept Type C: The Nominal Species.

The Winter Meeting Banquet was held on the last evening in the Whitehall Suite of the Cardiff Thistle Hotel in a room used by wedding parties. Elliot once again carried out his duties as auctioneer, this year risking life and limb to raise funds for the BPS. He conducted the auction from a balcony where presumably the happy couple are presented to their wedding guests assembled below. The balustrade seemed very low and rather an inadequate barrier between the balcony and the floor about 3 metres below. Elliot survived and BPS funds were swelled. And so the conference drew to a close.

Next year is the 60th anniversary of the Society and celebrations commence at the annual meeting to be held in Newcastle, organised by Sara Marsham. I look forward to seeing you there.

Jane Pottas
BPS Secretary

BPS Winter Meeting: A Student's Perspective



Katy Owen
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I have always been interested in marine flora and fauna, but for many years focused mainly on macroalgae and marine invertebrates: organisms easily discovered during a good wander along a rocky shore. It took a chance encounter with a dinoflagellate bloom somewhere off the coast of western Canada to spark an interest which has gone on to shape my career. Six years (and several thousand miles) later, and I have just presented my work on phytoplankton to the wider scientific community for the first time. I am now in the second year of a PhD based between the University of East Anglia and the Centre for Environment, Fisheries and Aquaculture Science (Cefas). My research principally uses flow cytometry to investigate the size structure of phytoplankton communities within the North Sea. I found the British Phycological Society Winter Meeting to be an ideal environment for the inaugural speaker: it's possible to apply to the Awards and Training Committee for funding to assist with travel and accommodation expenses, there is a session dedicated to

student presentations and even a prize on offer for additional motivation. I found the conference to be large enough to ensure the presence of experts on topics ranging from the evolutionary origins of photosynthetic organelles to the effects of sonication on freshwater bloom dispersal; yet small enough to allow time for discussion of questions raised and interests shared. This made an ideal setting for connecting names to faces and mixing with authorities in the field, both well-established and up and coming. I would also like to highlight the positive reception given to new faces and new projects, something which is extremely encouraging and makes public speaking an enjoyable experience for all involved. I will be sharing these key points with my peers at both of my research institutes as part of my new role as a member of the BPS Education and Outreach Committee. I am excited at this opportunity to become involved with and contribute to ensuring the future success of the BPS, an organisation I feel to be a valuable resource for all algal enthusiasts.



British Phycological Society

59th Winter Meeting

Oral Abstracts

“Phagotrophy, Phylogeny and Horizontal Gene Transfer”

Professor John A Raven

Division of Plant Sciences, University of Dundee at SCRI

Abstract

Symbiosis is an important means of increasing the metabolic complexity and ecological opportunities of the association relative to that of either component in isolation. Endosymbiosis (phagotrophy *sensu lato*) rather than ectosymbiosis increases the potential for vertical transmission of inhabitants (=microsymbionts) and the possibility for horizontal gene transfer which, combined with loss of (a) gene(s) essential for free-living existence of the inhabitant makes the association obligate for that symbiont. Large-scale gene transfer and gene loss from the inhabitant produces an organelle, e.g. the plastids of all oxygenic eukaryotes except *Paulinella*. The cyanelles of *Paulinella* arose from endosymbiosis of an α -cyanobacterium, with very significant gene loss and, possibly, gene transfer to the host (=exhbitant) euglyphid. All other plastids arose from a β -cyanobacterium followed by large-scale loss of cyanobacterial genes from the overall symbiosis and to the exhbitant nucleus with subsequent import into the plastid of gene products needed for plastid function. In some chromalveolates there was a ‘green’ plastid preceding the present ‘red’ plastid identified from ‘green’ genes in the eukaryote nucleus. There are, however, cases of the occurrence of genes in photosynthetic eukaryotes which cannot be traced to either the mitochondrial or the plastid ancestor. Examples are the chlamydial genes in the diatom genome: did diatom ancestors have a chlamydial symbiont? Horizontal gene transfer might also involve viruses: the genome of a *Chlorella* virus has some genes of a photoprotective xanthophyll cycle, and an *Emiliania* virus has genes of sphingolipid synthesis. A case where horizontal gene transfer probably did not occur is from the food alga kleptoplastid ‘donor’ to saccoglossan molluscs, leaving unexplained the longevity (months in some case) of the kleptoplastids in the gastropod when only a small minority of the genes needed to replace damaged plastid proteins occur in the plastid genome.

“Cutting the canopy to defeat the selfish gene”

Prof. Kevin J Flynn

Centre for Sustainable Aquaculture Research, Swansea University

Abstract

Mixotrophic phytoplankton could be considered as representing a “jack-of-all trades, master of none” configuration. In particular this applies to the internal space competition between the two modes of nutrition (phototrophy vs phagotrophy) which results in a lower Chl:C maximum than one may expect in similar sized pure phototrophic organisms. Under light-limiting conditions such a penalty restricts the growth potential of the cell. In attempting to maximise biofuels production it is noted that while the selfish gene drives the individual cell to optimise on a high Chl:C_{max}, for the population, a lower Chl:C_{max} is desirable. Genetic modification to lower the value of Chl:C_{max} has clear advantages which, however, results in an organism configuration which is overwhelmed by competition with native strains which retain a high Chl:C_{max}. Mixotrophs, however, can potentially remove their competitors. This raises the question as to whether mixotrophs may optimise their own population biomass in situations where they dominate through having a lower Chl:C_{max}, while removing their photosynthetic competitors which would otherwise shade them out and leave them under-resourced for light. This potential will be explored, making use of mechanistic models.

“Genes of Cyanobacterial Origin in Plant Nuclear Genomes Point to a Filamentous True-Branching Heterocyst-Forming Plastid Ancestor”

Mayo Roettger, W Martin and T Dagan

Universitaet Duesseldorf

Abstract

Plastids are descended from a cyanobacterial symbiosis that occurred over 1.2 billion years ago. While most genes were lost, many genes of the cyanobacterial genome were relocated to the host nucleus by endosymbiotic gene transfer during endosymbiosis. It has recently been suggested that the ancestor of plastids might have been an organism more similar to filamentous heterocyst-forming (nitrogen-fixing) cyanobacteria (section IV) (Deusch et al. *Mol Biol Evol* 25:748–761, 2008). However, that analysis did not include members of section V cyanobacteria that are filamentous, heterocyst-forming and true-branching, because no genomes were available for that group. Aiming to better understand the genome of the cyanobacterial ancestor of plastids, we have sequenced the genomes of five section V cyanobacteria strains (three *Fischerella* and two *Chlorogloeopsis*), and one additional section IV strain (*Scytonema*). Our phylogenetic reconstruction includes 119,815 proteins encoded in 6 photosynthetic eukaryotes: *Arabidopsis*, *Oryza*, *Physcomitrella*, *Chlamydomonas*, *Ostreococcus*, and *Cyanidioschyzon*. The homologs for each protein encoded in these genomes were sought among 2,526,501 proteins encoded in 43 sequenced cyanobacterial genomes, 650 other reference prokaryotic genomes, and 12 reference non-photosynthetic eukaryotic genomes. In total, 42,201 phylogenies of archaeplastidan proteins were reconstructed. These phylogenetic trees were then screened to find the nearest neighbor of nuclear genes within the six eukaryote genomes. Our results indicate that genes of cyanobacterial origin show highest overall sequence identity with contemporary cyanobacterial members of filamentous, true-branching heterocyst forming section V. Many known endosymbiotic relations between eukaryotes and cyanobacteria rely on the nitrogen supplied by the endosymbiont. Thus it is possible that this kind of endosymbiosis was incurred at the origin of plastids.

“The role of photosynthesis and food uptake for the growth of marine mixotrophic dinoflagellates”

Per Juel Hansen

Marine Biological Laboratory, Denmark

Abstract

Mixotrophy (i.e. combined use of photosynthesis and food uptake for growth) is widespread among marine dinoflagellates and involves species with permanent chloroplast as well species with permanent or temporary symbionts. Species with permanent chloroplasts generally display a growth response towards irradiance like an ordinary autotrophic alga. However, some species cannot grow in the light on a standard inorganic nutrient medium, because they require the ingestion of prey for sustained growth. This includes species with various types of chloroplast origin. Only a few species have been shown to be able to grow in the dark if supplied prey. About half of the studied species were primarily phototrophic species, and food uptake on marginally increased their growth rates at low irradiances. These are all known to form red tides red tide, and they may impact prey populations substantially during blooms. In the remaining species, food uptake increases to a large degree their growth rate when light is limiting and in some cases even when irradiance is not limiting growth. Some of these species grow relatively fast at high irradiances without food, while other species only grow slowly or cannot even maintain themselves at high irradiances without food. These species are non-bloom formers and their role as grazers in nature is unexplored. Dinoflagellates which form symbiosis with endo- and ecto-symbionts are a very heterogeneous group of dinoflagellates, which has been studied only sporadically. Some species are clearly in the phototrophic end of the spectrum, while others rely heavily on food uptake for growth.

“Comparison of enzyme regulation in algae with different



evolutionary histories: a eustigmatophyte, a bacillariophyte and a chlorophyte”

Brigitte Gontero, Stephen Maberly and Carine Puppo

Laboratoire Enzymologie de Complexes Supramoléculaires, France

Abstract

The regulation of carbon assimilation has been studied extensively in ‘model algae’ such as *Chlamydomonas reinhardtii*. Ecologically however, algae that evolved from different phagotrophic histories are equally or more important, but less-well studied. In this work, we compare the regulation of two key Calvin cycle enzymes, glyceraldehyde-3-phosphate dehydrogenase (GAPDH) and phosphoribulokinase (PRK), in three different algae: *C. reinhardtii* (Chlorophyceae, primary endosymbiosis-chlorophyll *a* and *b*), *Asterionella formosa* (Bacillariophyceae, tertiary endosymbiosis- chlorophyll *a*, *c* and fucoxanthin) and *Pseudocharaciopsis ovalis* (Eustigmatophyceae, tertiary endosymbiosis- chlorophyll *a* only). In *A. formosa*, GAPDH activity was high and independent of pH upto pH 8 but declined abruptly above that. In *C. reinhardtii* and *P. ovalis*, GAPDH activity was optimal at pH 8.4 and declined sharply at lower pH especially for the chlorophyte. GAPDH was redox-regulated in the three species, but the extent varied: 9-fold in *C. reinhardtii*, 6-fold in *A. formosa* and 2-fold in *P. ovalis*. The half-time of activation of GAPDH upon reduction was rapid in *A. formosa*, but slower in *P. ovalis* and *C. reinhardtii*. Surprisingly, the non-reduced GAPDH was inhibited by its co-factor, NADPH, in *A. formosa* and *P. ovalis*, with inhibition constants of less than 10 μ M. PRK from *A. formosa* was not redox-regulated but it was in the two other algae where the half-time of activation was 1.4 minutes in *P. ovalis* and 2.7 minutes in *C. reinhardtii* and the extent of activation was 2-fold and 4-fold respectively. These different algae have different and complex histories of gene-exchange, potentially mediated by phagotrophy, and remarkably different patterns of Calvin cycle regulation that may be physiologically relevant and significant for their success and distribution in different environments.

“*Paulinella chromatophora* – The acquisition of a photosynthetic organelle”

Eva C. M. Nowack, Arthur Grossman, Michael Melkonian, Gernot Glöckner

The Carnegie Institution for Science, California

Abstract

The thecate amoeba *Paulinella chromatophora* (Rhizaria) harbors two conspicuous photosynthetic units of cyanobacterial origin, termed ‘chromatophores’. The recent discoveries that chromatophores evolved independently of plastids, that the chromatophore genome is in size intermediate between that of a free-living cyanobacterium and a plastid, and that at least two genes were transferred from the chromatophore to the host nuclear genome by endosymbiotic gene transfer (EGT) suggest that *P. chromatophora* is an ideal model to infer early steps in the evolution of photosynthetic organelles.

To assess the extent of EGT and to address the question of how the host regulates chromatophore performance, we generated a comprehensive reference transcriptome dataset for *P. chromatophora* on which we mapped short Illumina cDNA reads generated from cultures in the dark and light phases of a diel cycle. Combined with extensive phylogenetic analyses of the deduced protein sequences, these data revealed that (1) 0.3-0.8% of the nuclear genes were a consequence of endosymbiotic gene transfer, compared to 11-14% in the Plantae, (2) transferred genes show a distinct functional bias in that many encode small proteins involved in photosynthesis and photo-acclimation, and (3) host cells established control over expression of transferred genes. The finding that a significant number of transferred genes are involved in photosynthesis and photo-acclimation, as well as the observed transcriptional regulation of these genes by light, strongly implies import of the encoded gene products into chromatophores. Immunolocalization studies of the nuclear-encoded (i.e. transferred) photosystem I subunit PsaE have demonstrated for the first time, that a protein synthesized in the cytoplasm of *P. chromatophora* can be imported into the chromatophore; this feature was previously thought to be restricted to canonical plastids and mitochondria. In sum, our results imply that a mechanism by which *P. chromatophora* exerts control over the

performance of its newly acquired ‘organelle’, involves controlled expression of nuclear-encoded, chromatophore-targeted proteins associated with photosynthetic electron transport.

“How hardy are estuarine seaweeds? – What can they tell us about this stressful environment?”

Martin Wilkinson & Holly Brown
Heriot-Watt University, Edinburgh

Abstract

The European legal requirement to assess estuarine quality using macrophytes, among other organisms, has focussed attention on a frequently neglected group of seaweeds – the attached intertidal macroalgae of estuaries. The hypothesis is advanced that because the estuarine environment is so physically stressful only a few well-adapted species can survive, and they will be relatively insensitive to anthropogenic stresses. A survey of a large number of British estuaries shows this to be only partially true. The particularly species-poor upper reaches do seem to largely obey this hypothesis. But the lower reaches, which are more species rich, can show floral variation between estuaries in relation to local conditions. Intermittent observations on several estuaries which have shown major recovery from pollution in the last 40 years show that the lower estuarine flora can become more species-rich and diverse. Most notably the upstream penetration limit of perennial species, represented by fucoids, can significantly advance to such an extent that a quality assessment tool might be based on it. However there is variation between estuaries in which is the dominant *Fucus* species contributing to this limit. The well-known estuarine species, *Fucus ceranoides*, appears to be absent from about one third of British estuaries. A superficial correlation of this absence with pollution status suggested the absence of *F. ceranoides* might be an indicator of poor quality but more detailed analysis shows that there are strong natural factors as well as anthropogenic ones affecting the occurrence of this species so that it is not possible to use the particular species of upstream penetrating *Fucus* as a more subtle assessment tool.

“Assessing macroalgal blooming in estuaries”

Dr. Clare Scanlan
SEPA, Aberdeen

Abstract

Estuaries are influenced by riverine inputs, and consequently may be subject to elevated nutrient levels, often from agricultural activities. Opportunist macroalgal species can thrive in areas of suitable substratum and nutrient availability, and may cause blooms of nuisance proportions. The secondary effects of macroalgal blooms are well known, but the Water Framework Directive requires a direct assessment of the algae themselves. As estuaries become naturally species poor with the decline in salinity going upstream, species diversity is an inappropriate measure for quality assessment, so the spatial extent and abundance of blooms is being used. However, many factors influence the presence and growth of algae in estuaries and the relationship between nutrients and the presence of blooms is not clear-cut. A predictive model has been developed and is being tested. The talk discusses issues around macroalgal blooming and its assessment.

“Seaweeds of Somerset: Assessing changes in seaweed floras”

Prof. Juliet Brodie & Nigel Chaffey
Natural History Museum, London

Abstract

One of the problems of determining whether and how seaweed floras are changing in response to climate change is the lack of historical data which can be compared with current observations. Detailed seaweed surveys from sites along the Bristol Channel, southwestern England, have been undertaken on the Isles of Scilly from 27 years ago, Lundy Island, Devon from c. 60 and 40 years ago, and from intertidal sites along the Severn Estuary in Somerset from c. 30 years ago. Recent studies surveying the seaweeds of Isles of Scilly (2010), Lundy (2008) and of Somerset (2008-20010), have provided data which can be used to compare with these earlier studies. Whilst the majority of species previously recorded have been re-found at all sites, the most noticeable change is the appearance of non-native algal species on the Isles of Scilly

and Lundy which were not recorded 27 and 60 years ago. Changes in the Somerset seaweed flora are less obvious, and non-native species such as *Sargassum muticum* have not been recorded. However, the presence of c. 100 species in the Severn Estuary makes the Somerset coast important for its seaweed flora in the UK context. The discovery of species not recorded previously and new species in the UK seaweed flora probably reflects a better taxonomic understanding of critical taxa. In this talk I will review the results of these UK studies and consider them in the broader context of change.

“Microphytobenthic diatoms in estuaries: patterns of species richness and potential impacts of tidal energy barrages”

Graham J. C. Underwood

Biological Sciences, University of Essex

Abstract

Benthic diatoms (termed microphytobenthos or MPB) living on sand and silt sediments are a major source of primary production in estuarine systems, particularly in muddy estuaries where phytoplankton activity is severely light limited. Species richness in benthic diatoms is related to community functioning, and varies over both small and large scale spatial and temporal dimensions. An analysis of patterns of species richness of diatom communities in eight UK estuaries in England and Wales is presented, showing the presence of distinct estuarine floras. The Severn estuary supports extensive benthic diatom populations, with annual production of MPB estimated at 33 g C m⁻² of intertidal area y⁻¹, utilizing 3.9% and 4.9% of the annual estuarine N and P loads. Construction of proposed tidal energy barrages would have significantly reduced annual estuarine MPB production (by 77% for the Cardiff-Weston barrage). It was unlikely that any potential increases in MPB biomass on remaining intertidal areas would have been sufficient to compensate for these losses.

Presidents Address:

“Stardust and a story of phycological enlightenment”

Professor Juliet Brodie

Natural History Museum, London

When stars are formed, stardust falls away and light shines through. In the scientific process, data accumulate, punctuated with rare moments of discovery when the metaphorical dust falls away and there is enlightenment. Sometimes discoveries slip quietly into the knowledge stream, sometimes they are controversial, leading initially to fierce debate, huge shifts in conceptual thinking and, typically, eventually to acceptance. Who, for example, would now question the theory of endosymbiosis or plate tectonics? In this talk I will use the analogy of star formation to explore my view of the scientific world based on a quarter of a century of phycological research. I will include a review of systematics from 6000 BC to the present day, the journey my work has taken, including discoveries and controversies, from a pre-molecular tradition to molecular taxonomy and phylogenetics and contemplate a future beyond the genome and the web.

“Blooming Marvellous: Long term dynamics, diversity and drivers within *Emiliania huxleyi*-dominated phytoplankton blooms”

Andrea Highfield, Maja Panayi, Steven Ripley, Brandon Drescher, Anthony W. Walne, Alison R. Taylor, Matthew J. Hall, Peter I.

Miller, Declan C. Schroeder

The Marine Biological Association, Plymouth

Abstract

Characterisation of an *Emiliania huxleyi* –dominated bloom in the western English Channel was undertaken using a combination of scanning electron microscopy and genetic analysis through which we identified a stable population dominated by a single morphotype and genotype. Similar methods were applied to archival samples of the continuous plankton recorder (CPR), and changes in bloom composition in the perennial late summer Ushant bloom were tracked through four decades to see whether populations of this globally important phytoplankton are changing. Two distinct genotypes of *Emiliania huxleyi* were found to dominate the phytoplankton blooms in this region and

significant changes in the genetic structure of the population were detected during the time period analysed. Key driving factors that regulate bloom dynamics were also investigated including *E. huxleyi*-specific viruses (EhVs), with the virus communities showing an unprecedented level of genetic diversity.

“Flow cytometric assessment of *Thalassiosira* and *Emiliania* viability during nutrient stress and the relationship between viability and pigment degradation”

Daniel Franklin, Aïrs RL, Fernandes M, Bongaerts RJ, Malin G
Centre for Conservation Ecology and Environmental Science, Bournemouth

University

Abstract

Cell viability in natural populations of eukaryotic phytoplankton is likely to be variable, as has been demonstrated in heterotrophic bacterioplankton. We lack the methods to discriminate this physiological variability which may have implications for bulk (pigment-based) assessments of primary production. Therefore, we measured biomass and viability (as membrane permeability, esterase and caspase activities; CMFDA, SYTOX-green and CaspACE labelling) in the coccolithophore *Emiliania huxleyi* and the diatom *Thalassiosira pseudonana*, during batch-culture nutrient limitation. The fluorescent stains gave insight into the cell changes caused by nutrient exhaustion, and we related these changes to cell death. Photosynthetic pigment transformation, and the breakdown of dimethylsulfoniopropionate (DMSP), were also analysed due to the importance of these molecules in biogeochemical cycles. *E. huxleyi* persisted for 1 month in stationary phase after the onset of nutrient exhaustion. In contrast, *T. pseudonana* cells started to decline within 10 days of nutrient depletion. *T. pseudonana* progressively lost membrane permeability and the ability to metabolise CMFDA whereas *E. huxleyi* developed two distinct CMFDA populations and retained membrane integrity. Perhaps counterintuitively, caspase activity appeared higher in *E. huxleyi* than *T. pseudonana* during the post-growth phase, despite a lack of mortality and cell lysis. Photosynthetic pigment degradation and transformation occurred in both species after growth; chlorophyll *a* (chl *a*) degradation was characterised by an increase in the ratio of methoxy chl *a*/chl *a* in *T. pseudonana* but not in *E. huxleyi*, and the increase in this ratio preceded loss of membrane integrity. Total DMSP declined in *T. pseudonana* during cell death and DMS increased. In contrast, and in the absence of cell death, total DMSP increased in *E. huxleyi*, as did DMS. Our data shows chlorophyll transformation associated with a measurable loss of viability in *T. pseudonana*, and suggests a promising new approach to discriminate non-viable diatom cells in nature.

“Transcriptomic and Physiological Response of Different *Emiliania huxleyi* Isolates to Elevated Seawater pCO₂ Condition”

Frédéric Verret, Stuart Finch, Bela Tiwari, David J. Suggett, Christine Raines, Richard J. Geider,

Colin Brownlee and Declan Schroeder

The Marine Biological Association, Plymouth / Department of Biological Sciences, University of Essex

Abstract

Ongoing increase in atmospheric carbon dioxide concentration is lowering surface seawater pH and carbonate ions concentration. Laboratory and field experiments carried out to study the consequence of such physicochemical perturbation on the most abundant coccolithophore species *Emiliania huxleyi* have so far produced contradictory results. These apparent inconsistencies can be explained by differences concerning the strain used, the environmental conditions (laboratory cultures vs. natural assemblages) and the methodology employed to lower the pH (acid added vs. CO₂ bubbling). Here we test the hypothesis that *E. huxleyi* with different coccolith morphologies and isolated from different oceanic regions share a common molecular and physiological response to increased seawater pCO₂. *E. huxleyi* isolates have been grown in pH-stat cultures under different pCO₂. Transcriptomic response has been analysed using two complementary technologies: digital gene expression tag-based approach and whole genome tiling microarrays. In parallel, physiological parameters such as



growth rate, photosynthesis efficiency, carbon and nitrate consumption, coccolith morphology, production of particulate organic and inorganic carbon have been measured. We aim with this approach to give a broader understanding of the molecular & physiological response of the *E. huxleyi* species complex to elevated pCO₂.

“A re-examination of the production of DMSP by dinoflagellates”

Gill Malin, Caruana, A., Turner, S. and Steinke, M.

School of Environmental Sciences, University of East Anglia

Abstract

Marine phytoplankton play a fundamental role in the biogeochemistry of the volatile sulphur compound dimethyl sulphide [DMS; (CH₃)₂S] through production of its major precursor dimethylsulphoniopropionate [DMSP; (CH₃)₂SCH₂CH₂COOH]. Both compounds have attracted research attention because DMS is a key compound in the global sulphur cycle, and because it may also play a climate-cooling role via the production of atmospheric aerosols that can act as cloud-condensation nuclei. Keller and co-workers conducted a major survey on DMSP in phytoplankton cultures in the late 1980s. This highlighted dinoflagellates as one of the key DMSP-producing phytoplankton groups, though intracellular concentrations were actually rather variable. In the intervening years dinoflagellates have not attracted as much attention as prymnesiophytes, but data from subsequent field and lab studies is generally supportive of the suggestion put forward by Keller et al. During this project DMSP data were compiled from the literature and our own experiments. This revealed an average DMSP concentration of 242 mM but spreading across a 6 orders of magnitude range (n=66). The data were analysed relative to various biological criteria that underpin the broad diversity of this plankton group and bioluminescent and species with haptophyte-like plastids appeared to have significantly lower DMSP concentrations. Experiments were done with a range of species including the heterotrophic dinoflagellate *Cryptothecodinium cohnii*. In batch cultures of *C. cohnii* DMSP concentration increased from 61 to 255 mM with carbon depletion and rapidly decreased again upon carbon addition. Overall our study reinforces the position of dinoflagellates as an important DMSP-producing group. The implications for modelling regional and global DMS emissions will be discussed.

“Throwing toxic dinoflagellates into the melting pot! Detecting genetic diversity in *Karenia mikimotoi*”

Declan Schroeder, Manal A. Al-Kandari, Andrea C. Highfield, Matt J. Hall and Paul Hayes

The Marine Biological Association, Plymouth

Abstract

Karenia mikimotoi is a toxic dinoflagellate, known to form extensive populations in the Eastern North Atlantic and Pacific Oceans that impact significantly on recreation and fisheries industries in these areas. Attempts to resolve the complex taxonomy within this “species” have been hampered by the requirement for fine-scale morphological analyses and by the lack of suitable genetic markers. Here we report the use of a novel combination of primer sets designed to discriminate between *K. mikimotoi* isolates originating from different geographical regions. Specific PCR-based primers were designed for subsequent high resolution analysis of the PCR amplicons. This innovative technique allows us to rapidly discriminate *K. mikimotoi* from Japanese, New Zealand and European origins. I will discuss the implications of our findings with respect to the long debated question of whether *K. mikimotoi* is an alien in European waters.

“The spring diatom bloom in Scottish waters; regional differences and interannual variation”

Eileen Bresnan, Dougal Lichtman, Sheila Fraser, Ana-Louisa Amorim, Sarah Hughes, Michael Penston and Steve Hay

Marine Scotland Marine Laboratory, Aberdeen

Abstract

The spring diatom bloom is a critical period in the phytoplankton annual cycle. To date, the spring bloom has yet to be examined on a regional scale in Scottish waters. To achieve this, the timing and diversity of the spring bloom was examined at six sites from the Marine Scotland Science (MSS) coastal ecosystem monitoring programme

(<http://www.scotland.gov.uk/Topics/marine/science/MSInteractive/Coastal>). Temperature data from the monitoring sites showed regional variation during the spring bloom period with water temperatures at sites on the west coast approximately 1°C warmer than at sites on the east. Corresponding phytoplankton data reveal a difference in the timing of the appearance of the spring bloom, with high diatom cell densities observed during March at sites on the west coast, Orkney and Shetland. This timing is later at the east coast site with high diatom densities observed in April and May. A change in the species composition of the spring bloom has been observed with the genus *Skeletonema* increasing in abundance at all sites since 2005. Examination of the nutrient data from the East Coast site reveals a decrease in the rate of silicate uptake from the water column during this period despite an increase in diatom cell densities. This suggests that the more recent diatom community has a lower requirement for silicate or that other phytoplankton groups may be increasing in importance. This information is important to evaluate phytoplankton tools developed to assess the state of the marine ecosystem as well as to improve our understanding of the dynamics of the phytoplankton community in Scottish coastal waters.

“Calcium signaling in the regulation of gliding motility and phototaxis in a benthic diatom”

Deirdre McLachlan, Graham Underwood, Alison Taylor, Richard Geider & Colin Brownlee

School of Biological Sciences, University of Bristol

Abstract

Motility in response to light allows organisms to maximise photosynthetic efficiency while avoiding deleteriously high irradiance. Many types of motile microalgae have been observed to accumulate in areas with moderate fluence-rates and disperse from areas of high fluence. Two distinct motile responses to light were defined in the pennate diatom *Navicula perminuta*. Confocal scanning laser microscopy and fluorescent indicators were used to image intracellular Ca²⁺ dynamics during the response to high intensity blue light. Calcium transients were involved in stimulus-induced reversal of cell direction, and corresponded with time of direction change rather than onset of stimulus. Inhibitor experiments suggested that the calcium required for this response originated from intracellular stores whereas calcium dependent motility required influx from the external medium. The results suggest that regulation of the cytoskeletal organisation that underlies directional secretion and motility is under the control of calcium signalling.

“Rate of production and chemical composition of carbohydrates at different growth stages of polar diatoms”

Dr. Shazia N. Aslam, Tania Cresswell-Maynard, David N. Thomas and Graham J. C. Underwood

Department of Biological Sciences, University of Essex

Abstract

Diatoms and their associated mucilage secretions (composed of extracellular polymeric substances - EPS, mainly carbohydrates) are major constituents of the dense microbial assemblages that grow within marine sea ice. EPS production is thought to confer a survival advantage to cells in the harsh conditions within sea ice brine channels. Both extracellular and intracellular carbohydrate produced by three polar sea ice diatom species; *Synedropsis* sp. (ccmp2745), *Fragilariopsis curta*, and *Fragilariopsis cylindrus* were quantified and chemically characterised at different growth stages. In general soluble/colloidal carbohydrate fraction (CC fraction) was the major carbohydrate containing fraction at different growth stages (log and stationary) and contributed up to 50, 74 and 52% to total neutral carbohydrates (TNCHO) for *Synedropsis*, *F. curta* and *F. cylindrus* respectively. Highly complex / less ethanol soluble EPS (EPS-30%) were more abundant in CC fractions produced by *F. cylindrus* (up to 59%) and *F. curta* (up to 50%) in comparison to *Synedropsis* (up to 15%) at all growth stages. Colloidal polysaccharides (CP) were mainly composed of xylose, mannose, galactose and glucose. Hot water (HW) extracted carbohydrate were dominated by glucose and contributed up to 80, 61, 80% to total monosaccharide (in the HW fraction) for *Synedropsis*, *F. curta* and *F. cylindrus* respectively. Least amounts of carbohydrates were detected in hot bicarb (HB) and hot alkali (HA) fractions; together they contributed up to 20, 15 and 27% to TNCHO

for *Synedropsis*, *F. curta* and *F. cylindrus* respectively. HB fraction was dominated by xylose, mannose, galactose and glucose for all three species. HA was mannose-rich for both *Fragilariopsis* species where mannose contributed 50% to total monosaccharide composition, while HA produced by *Synedropsis* was more heterogeneous.

“Microphytobenthic dilemma: to photoacclimate, to photoregulate, or to migrate?”

J-L. Mouget, Perkins, RG, Lavaud, J, Lefebvre, S, Barillé, L, Rosa, P, Méléder, V, Laviale, M, Gaudin, P, Serodio, J, Cartaxana, P, Jesus, B

Abstract

Intertidal estuarine sediments constitute highly productive ecosystems. These environments are characterized by fluctuating conditions (light, temperature, salinity, nutrient concentrations), especially due to tides and currents. In muddy environments, primary production mainly relies on microphytobenthos (MPB), often dominated by epipellic diatoms, which form transient biofilms at the sediment surface during diurnal emersion periods. At low tide, MPB can thus encounter high irradiances ($> 2000 \mu\text{mol photons m}^{-2} \text{ s}^{-1}$), potentially damaging to the photosynthetic apparatus of most algae and causing a decrease in photosynthesis and growth. The processes responsible for this photoinhibition *sensu lato* (general decrease of a physiological process, as a result of possible damage and repair mechanisms) are variable, according to the time scale considered. On the short term (from seconds to a few hours), photoregulation refers to fast down-regulation through the xanthophyll cycle, while photoprotection or photoinactivation includes other mechanisms at the photosystems. Photoacclimation usually refers to phenotypic changes at the plastid or the cell level (pigment content, enzyme activity, etc.), evidenced on a longer term (day to season), as modulated by growth rate and cell cycle. In MPB, the responses to change in light can also involve a behavioural process, vertical migration in the sediment-biofilm matrix. In our work, MPB light responses were studied using biofilms formed according to different processes (artificial, engineered, natural *ex situ*), and exposed to natural or UV-free incident irradiances. The use of specific inhibitors (DTT for the xanthophyll cycle, Lat-A for the migratory capacity), allowed to demonstrate that migration was the main strategy used by MPB in response to increasing light dose to cope with photoinhibition ($> 1\text{h}$), and that UV radiation contribute little, in comparison with high PAR. On the shorter term ($< 1\text{h}$), fast regulation mechanisms and microcycling inside the sediment/biofilm matrix are likely to be used, to help maintaining high photosynthetic rate.

“Green algae as bioindicators of heavy metal pollution in Wadi Hanifah Stream, Riyadh, Saudi Arabia”

Prof. Dr. Ali A. Al-Homaidan, Abdullah A. Al-Ghanayem, Areej H. Alkhalifa

Department of Botany and Microbiology, King Saud University

Abstract

Anthropogenic activities around the main stream of Wadi Hanifah may lead to a considerable increase in the heavy metal loading of the stream. The two filamentous green algae *Enteromorpha intestinalis* (Linnaeus) Nees and *Cladophora glomerata* (Linnaeus) Kützinger were collected from three sites along the valley and used to determine the heavy metal concentrations in the main stream. The dried algal samples were digested using appropriate acids and the concentrations of manganese (Mn), copper (Cu), Zinc (Zn), Arsenic (As), cadmium (Cd) and lead (Pb) were measured in the aliquot samples using Inductively Coupled plasma-Optical Emission spectrometer (ICP-OES). High burden of manganese, copper and arsenic were detected at all sites indicating a high degree of pollution by these elements. The levels of zinc, cadmium and lead were within the expected limits for uncontaminated areas. *E. intestinalis* could be used as an excellent indicator for manganese, zinc and arsenic pollution, whereas *C. glomerata* may be used as an excellent indicator for copper, cadmium and lead pollution in this area. The stream runs through the city of Riyadh and serious efforts should be considered to decrease the heavy metal levels in this fragile and valuable habitat.

“Energetic constraints on nitrogen uptake and assimilation by the

deep water red seaweed *Anotrichium crinitum*”

Daniel William Pritchard, C. Hepburn, J. Beardall and C. Hurd
Queen’s University Marine Laboratory (QML), Northern Ireland

Abstract

Anotrichium crinitum (Rhodophyta) is a dominant component of subtidal rocky reefs below 10 m along the coast New Zealand’s South Island. Long term *in situ* light (PAR) information suggests that growth and photosynthesis of *A. crinitum* is frequently light limited. We hypothesised that light limitation would lead to the preferential use of ammonium (NH_4^+), a less abundant but energetically inexpensive form of inorganic nitrogen. In culture, *A. crinitum* takes up nitrate (NO_3^-) and shows high levels of nitrate reductase activity (NRA), which increase to maximal rates over a range of ecologically relevant light levels. This suggests that *A. crinitum* has the capacity utilise NO_3^- . However, although NO_3^- is available *in situ* throughout the year, field harvested *A. crinitum* shows a strong preference for NH_4^+ , has negligible internal NO_3^- pools and a limited capacity to take up nitrate. We suggest that *A. crinitum* primarily utilises NH_4^+ *in situ* and this may help support growth and primary productivity during the long periods of low light that characterise this site.

“Evolution of the algal ionome: progress and perspectives”

Heroen Verbruggen

Ghent University, Belgium

Abstract

Trace elements like Cu, Zn and Fe are present in small amounts in the environment yet are required as a cofactor in metalloproteins. About one quarter of all proteins require a metal ion to carry out their functions. They are responsible for many crucial redox processes in the cell, including photosynthesis. A comparative study of the ionome of 29 phytoplankton species grown under nutrient-replete conditions has shown that trace elemental composition correlates with the plastid type, green algae requiring more Cu, Zn and Fe than chromalveolate algae (Quigg et al. 2010, *Proc Roy Soc B*). I review current knowledge on the topic and infer the evolution of trace metal usage along a time-calibrated phylogenetic tree. I will present an ongoing project that combines empirical determination of trace metal usage with metalloprotein bioinformatics that will further advance our knowledge of algal trace metal usage.

“Sexual reproduction in marine brown macroalgae”

Dr. John Bothwell, Medical Biology Centre, Queen’s University Belfast

Abstract

Many brown macroalgae can reproduce sexually. Sexual algae may be homothallic, with individual plants producing both male and female gametes, or heterothallic, with male and female gametes being generated by different individuals that otherwise display little or no sexual dimorphism. Sex determination is genotypic, but in contrast to data on sex-determining regions in animals and plants, no sex-determining locus has been identified in brown macroalgae. The lack of heteromorphic chromosomes in all brown macroalgae studied to date, together with observations of low sexual phenotype variation, suggest that any sex-determining regions will be small. We are currently looking at inbred and bulk segregant male and female populations of the model brown macroalga, *Ectocarpus siliculosus*, to identify sex-linked regions of the genome. It is hoped that this work will be developed in three ways: First, physiological, to identify sex-determining genes; second, ecological, to provide markers with which to probe the population structure of coastal seaweeds; third, evolutionary, to look at the evolution of sex in the heterokonts, an evolutionarily distinct multicellular eukaryotic lineage.

“Chemosphere of the marine green alga *Ulva* and its associated bacteria”

Thomas Wichard

Friedrich Schiller University, Germany

Abstract

One fascinating discovery in microbiology is the mutualistic interaction that occurs between prokaryotes and eukaryotes (“cross-kingdom cross-



talk”). It has been suggested that the ecological success of the family Ulvaceae is linked to its associated bacteria. The interactions between algae and bacteria may depend strongly on chemical stimuli. These chemical cues are called infochemicals and the identification of these intriguing metabolites is essential to the understanding of signal mediated cross-kingdom interactions. Using bioassay-guided and explorative (exo-metabolomics) approaches we aim to decipher the chemosphere of the *Ulva* spp. and their associated bacteria. Here, we define the chemosphere as a part of the biocoenose, where the organisms interact with each other *via* infochemicals. A pre-requisite for the investigation of cross-kingdom interactions is the availability of axenic algal isolates. To produce axenic cultures gametophytes of *Ulva mutabilis* Føyn were induced to form gametangia by removal of sporulation inhibitors. Afterwards, gametes were separated from their accompanying bacteria by taking advantage of the gametes fast movement towards light. This allowed us to inoculate a fully defined seawater medium with axenic gametes of *U. mutabilis*. In the laboratory of Prof. Oertel (University of Regensburg, Germany), it was shown that *U. mutabilis* is not able to grow without certain bacteria. Interestingly, two isolated strains can completely replace the bacterial flora of *U. mutabilis* and induce readily its morphogenesis based on diffusible molecules (morphogenetic substances). Using this well-defined unialgal/bi-bacterial system, our work concentrates on the elucidation of the chemosphere, the identification of novel signal molecules and the determination of the mechanism by which *U. mutabilis* actively contributes to this interspecies communication.

“Influence of hydrodynamics on growth and nutrient uptake of juvenile *Laminaria digitata* in winter and summer”

Dr. Louise Kregting, Christopher Hepburn, Graham Savidge
Queens University Belfast Marine Laboratory

Abstract

Availability of nutrients can be considered one of the most important environmental factors influencing growth rates of macroalgae. However the rate of flux of ions such as those of inorganic nitrogen to a macroalgal thallus surface will depend in part on two factors: (1) the thickness of the diffusion boundary-layer (DBL), which depends on whether water flow is laminar or turbulent and is directly influenced by water velocity, (2) the metabolic demand of a macroalga, which will influence the rate of ion removal from the DBL. If metabolic demand is high, because a macroalga is nutrient deficient, then the rate of removal of an ion from the DBL will increase. However if a macroalga is nutrient replete or some other factor is limiting growth (eg. light) then the rate of ion removal will be lower. Therefore the degree to which water motion will influence nutrient uptake, and therefore growth, will depend in part on the internal nutrient status of macroalgae and the uptake rate of nutrients. The objective of this study was to examine the effect of oscillatory flow (turbulent flow) versus unidirectional flow (constant flow) on growth rates and nitrate uptake by the juvenile kelp, *Laminaria digitata*, in winter and summer when ambient seawater nutrient concentrations are maximal and minimal. Oscillatory flow experiments were conducted at a range of periods ($T = 3 - 6$ seconds) and average velocity's between 2 and 18 cm s⁻¹. Unidirectional flow experiments were conducted between 4.5 and 20 cm s⁻¹. The internal soluble nitrogen pools of *L. digitata* were also measured. Results suggest that increased velocity increased growth rate and nitrate uptake by juveniles in the low nitrogen summer period for both oscillatory and unidirectional flow, but not in winter when nitrogen is found in high concentrations.

Seasearch Guide to Seaweeds

Francis Bunker, Juliet Brodie, Christine Maggs, Anne Bunker

Abstract

The Seasearch Guide to Seaweeds of Britain and Ireland has just been published by the Marine Conservation Society aided by sponsorship from the BPS and several other organisations. This guide is designed to give an introduction to the seaweeds found around our coasts and aims to enthuse and inspire the lay public to study seaweeds and more specifically to help participants of the Seasearch project in species recording. This is the first attempt in many years to produce a layman's guide which includes species other than the usual few which normally

appear in popular marine-life guides. Over 200 species are included and all are illustrated here using colour photographs.

Identifying seaweeds using this guide relies on features which can be seen with the naked eye or using a hand lens. Users are guided first to separate seaweeds according to colour and then to growth form, after which specimens can be matched to photographs and descriptions.

Life of an apprentice

Ruth Crundwell

BTCV NATURAL TALENT SEAWEED APPRENTICE

Abstract

In April I was given the opportunity through the BTCV (British Trust for Conservation Volunteers) Natural Talent Scheme to become a 'Seaweed Apprentice'. I am seconded to the Scottish Environment Protection Agency (SEPA) in Aberdeen with Dr Clare Scanlan as my manager/mentor. The apprenticeship consists of two parts, to learn the ecology and identification of seaweeds in order to take part in the monitoring work SEPA does.

SEPA would like to have greater public engagement so the other part is to be involved in the creation of a Citizen Science Littoral Seaweed Project to raise the profile of macroalgae. At the moment this is very much 'work in progress' but it is envisaged that it will interact with projects already in the public forum such as OPAL, the Big Seaweed Search and The Shore Thing, rather than trying to 'reinvent the wheel'. The presentation will explain the aims and objectives of the BTCV Apprenticeship scheme. It will also focus on the life of a seaweed apprentice including its ups and downs, the 'story so far', and where it may go next.

It is therefore a very personal take on the new and exciting world of macroalgae!

Student Manton Prize Session

“The role of extracellular polymeric substances as protectants of benthic diatoms in hypersaline conditions”

Deborah Jane Steele and G. J. C Underwood
Plymouth Marine Laboratory, Devon

Abstract

The evolutionary strategy of microenvironment modification by diatoms (Bacillariophyceae) under high salinity conditions was investigated. Living as part of a biofilm, benthic diatoms produce large amounts of extracellular polymeric substances (EPS). To determine if it is possible for EPS to act as a biochemical buffer to diatom cells in hypersaline conditions, a model system was used; comprising axenic cultures of *Cylindrotheca closterium* and the polysaccharide xanthan gum. The effect of having xanthan gum in the media (0, 0.04, 0.38 and 0.75 %) was tested at different salinities (35, 50, 70 and 90) for growth, F_v/F_m and proportion of live cells (viability). Measurements of salinity and water activity were taken to establish how the xanthan gel, salt ions and cultures interacted. In a second experiment, the immediate response of cells to salinity change was investigated. Cultures grown at standard salinity, with and without xanthan gum, were subjected to salt shocks (to salinities of 17.5, 35, 50, 70 and 90); the immediate response of F_v/F_m was monitored.

Overall growth in a high concentration of xanthan gum increased cell density, quota and viability at all salinities. However some growth conditions reduced F_v/F_m including 70 salinity and 0.04 % xanthan. The structure of the xanthan matrix depended on the salinity of the original media and this had implications for desiccation, sequestration of ions and interaction with cells. Directly after salt shock cultures grown without xanthan suffered a decrease in F_v/F_m , however cultures grown in xanthan gum maintained high F_v/F_m , hence they were protected against salt stress by the xanthan matrix. The results indicate that cells living in an EPS matrix that undergoes fluctuating water potential may not have to produce energetically expensive osmolytes at the cost of growth rate.

“Protistan parasites of freshwater algae”

Sebastian Hess, Nicole Sausen, Michael Melkonian
Botanisches Institut, Germany

Abstract

Several eukaryotic micro-organisms have a parasitic or parasitoid lifestyle. In freshwater systems Chytridiomycota are well known to infest certain microalgae, but also unicellular protists are able to attack freshwater microalgae and are - similar to parasites - dependent on specific host algae. Since the 19th century scientists have described these protists and discussed their position in the system of life. Nowadays we don't know much about such parasites, because they are difficult to cultivate, and many species have never been found again since their original description. Furthermore, some descriptions are doubtful, because the criteria for species definition used in the past differed from those we use today. Using modern techniques of isolation and culturing some strains of protistan parasites of freshwater algae (mainly Zygnematophyceae) have been established, especially vampyrellid amoebae (*Vampyrella*, *Hyalodiscus* and *Leptophrys*) and amoeboflagellates. Three isolates with cercozoan affiliation (termed PC-strains), an unknown flagellate organism (UFO) with its very peculiar swimming behavior and an isolate of the old and doubtful genus *Pseudospora* have been studied regarding morphology, infection cycles and their phylogenetic position using the nuclear-encoded SSU rDNA. Furthermore, some preliminary results regarding host specificity have been obtained and microscopical time lapse techniques have been used to unravel the pattern of the very slow amoeboid locomotion of these parasites.

“The size spectrum of phytoplankton in the North Sea: a key parameter for ecosystem function”

Katy Owen, Veronique Creach, Rodney Forster, Gill Malin
Laboratory for Global Marine and Atmospheric Chemistry,
Norwich

Abstract

Phytoplankton can be divided into functional groups based on size: net (<200 µm), nano (2-20 µm) and pico (<2 µm). Size is an important parameter in terms of carbon turnover, nutrient uptake and trophic transfer efficiency within marine food webs. Current North Sea monitoring and research programmes typically utilise chemically fixed samples and consider only larger net and nanoplankton cells. Increased focus on live cells and the inclusion of picoplankton within analyses is required for accurate depiction of phytoplankton biomass and productivity within ecosystem models. Flow cytometry is a technique capable of the enumeration and assessment of thousands of cells within a few minutes. Particles within a sample stream are interrogated by laser, rapidly producing information on the optical properties of each individual particle. Net, nano and picoplankton cells can be quickly distinguished from debris, and an approximate identification based on cell size, structure and pigment content can be made with relative ease. The Cefas Groundfish survey covers 75 prime stations distributed across the southern and northern North Sea, including both coastal and open water sites. An onboard flow cytometer was used to analyse live size-fractionated phytoplankton communities for the duration of the 30 day cruise. The data obtained permit detailed description and mapping of phytoplankton community structure and diversity across both spatially and environmentally differing locations. It also serves to highlight the ease with which picoplankton cells can be included within regular monitoring programs, with initial results suggesting that assessment of their contribution to North Sea biomass and productivity should not be neglected.

“Interaction of Oxygen Production and Consumption in the Coccolithophorid *Emiliana huxleyi* under varying Environmental Conditions”

Stewart Finch and Prof. Richard Geider
University of Essex

Abstract

As the oceans absorb increasing atmospheric CO₂, the dissolution of the CO₂ decreases pH, leading to ocean acidification. These changes in surface ocean chemistry may affect many of the most abundant globally significant primary producers. As marine net primary productivity is a major contributor to global primary productivity it is essential to understand the factors that influence this process, and to establish accurate methods of quantification. Two strains of *Emiliana huxleyi*

(CH25 and CCMP 1516) were grown in continuous cultures in pH controlled environments at varying pCO₂. The effect of the CO₂ environment on oxygen production and consumption rates in the light was measured by Membrane Inlet Mass Spectrometer (MIMS) utilising O₂ isotope dilution techniques. Growth characteristics were also examined over the course of the study for growth rate, chlorophyll content and CO₂. The cultures were grown under a range of CO₂ conditions, including present and predicted future CO₂ environments.

The CH25 cultures were grown initially at a lower pCO₂ (~135ppm), and later shifted to a higher CO₂ condition (~533ppm), while the CCMP 1516 cultures were grown over a range of five CO₂ conditions (~170ppm to ~1000ppm). *Emiliana huxleyi* CH25 showed no significant differences, between the low and high CO₂ treatments, in gross photosynthetic rates (62.5 and 66.4 fmol O₂ cell⁻¹ h⁻¹), uptake (12.7 and 12.7 fmol O₂ cell⁻¹ h⁻¹), with the initial slope (α) and growth rates also showing no significant changes. The *E. huxleyi* 1516 strain was subjected to five CO₂ treatments, between glacial and predicted CO₂ conditions. Gross photosynthesis (90.62 to 114.79 fmol O₂ cell⁻¹ h⁻¹) and uptake rates (16.6 to 23.3 fmol O₂ cell⁻¹ h⁻¹) although variable, were not significantly different within the CO₂ treatments but were generally larger than in CH25. These results indicate that net oxygen production rates from the two strains examined so far will be unaffected by increased atmospheric CO₂.

“What's new in phylogeny of Oocystaceae (Trebouxiophyta): Insights and Questions”

Marie Pazoutová & Lenka Štenclová
University of South Bohemia, Czech Republic

Abstract

After 20 years of use of molecular methods in phycology, the concept of many traditional genera or higher taxa has been called into question. The family Oocystaceae, however, keeps its limits rather consistent until today and forms a well supported monophyletic clade inside class Trebouxiophyceae. Morphologically it is commonly recognizable by ovoid, „lemon-like“ cell shape with polar cell wall thickenings. On the ultrastructural level a specific cell wall structure has been reported. It seems that higher polymorphism in the 18S rDNA is characteristic for the group on the molecular level. The 18S rDNA sequences of Oocystaceae strains are usually longer than in the majority of other Trebouxiophyceae and often contain long introns. Although the family itself has been well defined on the molecular basis, the phylogeny inside Oocystaceae and the generic concept still remain unclear. In addition to the data published by Hepperle et al. (2000) and Krienitz et al. (2003), we sequenced six new strains from the genera *Oocystis*, *Lageheimia*, *Coenochloris*, *Echinocoleum* and *Willea*. There are two single strains of *Eremosphaera viridis* and *Oocystis solitaria* on the basis of the family and next to it a long-branch lineage of more or less coenobial taxa with *Makinioella* and *Crcicigeniella/Willea*. However, not all coenobial strains of Oocystaceae belong to this group, neither all its members are coenobial. Two species of spine bearing *Lagerheimia* are sisters in a separate lineage, suggesting the genus being monophyletic. On the contrary, two strains with ray-like shaped mucilage do not cluster together and belong to different genera *Echinocoleum* and *Ooplanctella*. For *Oocystis* itself, the paraphyletic nature of the genus was already shown, however, the data available so far do not allow us to do the final taxonomical conclusions.

“Understanding the biogeographic distribution and the species concept of species *Prasiola crispa* (Trebouxiophyceae, Chlorophyta)”

Mónica Moniz & Rindi, F
National University of Ireland, Galway

Abstract

Prasiola crispa is the type species for green algal genus *Prasiola*. It is a terrestrial green alga widespread in cold regions, often found associated with bird colonies or sites subjected to persistent mammalian urination and/or in city streets with high humidity conditions. It is one of the most common terrestrial algae in Antarctica but it is also present in the northern hemisphere. Using two chloroplast genes (*rbcL* and *PsaB*), we show that *Prasiola crispa* includes at least two cryptic taxa: the *Prasiola crispa* present in the northern hemisphere and Antarctica, which represents the genuine species (type locality: Isle of Skye, Scotland) and



another taxon found so far on King George Island and in Antarctica. Morphological examination based field and cultured material revealed no clear differences between these genotypes. We conclude that genetic diversity within this species has been underestimated.

“Is ITS2 evolution linked to speciation? A comparative analysis of the Ulvales as a case study”

Lenka Caisová, Birger Marin, Michael Melkonian
Universität zu Köln, Germany

Abstract

The Internal Transcribed Spacer 2 (ITS2) is a fast evolving part of the rRNA operon, located between the 5.8S and 28S rRNA genes. In many eukaryotic organisms ITS2 is currently used to indicate intercrossing ability among close relatives i.e. to predict the limits among ‘biological species’. The presence/absence of even a single Compensatory Base Change (CBC) in helices 2 and 3 is thought to correspond to incompatibility/ability to sexually cross. Until now, no comparative analysis of ITS2 secondary structure has been done for the green algal order Ulvales. To test the correlation between CBCs of ITS2 and the ‘biological species concept’ in the Ulvales, we investigated published and newly obtained ITS2 sequences for five families (86 sequences). The high degree of conservation of the secondary structure of ITS2 within the Ulvales allowed the generation of a secondary structure consensus model, and the introduction of a novel numbering system of ITS2 nucleotides for unambiguous positional identification of base pairs, CBCs, hemi Compensatory Base Changes (hCBCs) and indels. By comparative analyses using this approach we obtained the following results: (1) In the Ulvales, the presence of CBCs indicates the delimitation of genera and families rather than species. In fact, most branches at the species level are not accompanied by any CBC but, instead are frequently characterized by the presence of hCBCs. Apparently, genes, which control gametic compatibility and those responsible for morphological changes evolved considerably faster than the double-stranded regions of ITS2. (2) To gain more insight into the evolution of ITS2 characters, CBCs and hCBC were plotted on the tree topology, rather than merely comparing ITS2 characters among pairs of species. (3) Most, if not all CBCs in the ITS2 did likely not evolve via two successive hCBCs. (4) Substitutions of the hCBC type show a much higher background of homoplasy, i.e. parallelisms and reversals, than CBCs.

“Porphyra (Rhodophyta) diversity in Greenland”

Agnes Mols Mortensen, Chris D. Neefus, Poul M. Pedersen and Juliet Brodie
University of New Hampshire, Durham

Abstract

The taxonomy of the red algal genus *Porphyra* has been the focus of study in northern parts of the North Atlantic in recent years. Studies of the *Porphyra* floras of Iceland and the Faroes have led to the discovery of eleven *Porphyra* species in each of the areas and nine species common to both areas. Greenland is another area in the North Atlantic where *Porphyra* requires further study. Previous work reports *P. miniata*, *P. thulaea* and *P. umbilicalis* from Greenland but preliminary molecular work on collections from the area suggest a more diverse flora. Here we hypothesize that the *Porphyra* flora in Greenland is more diverse than previously thought and we ask i) How many *Porphyra* species are there? ii) Which species are found in the flora? iii) How does the *Porphyra* flora in Greenland compare to the North Atlantic *Porphyra* flora? Collections were made on the west coast of Greenland from the Disko Bay area in the north to Nanortalik in the south from May to October. The collections were from the intertidal and shallow subtidal. The collected material was dried to herbarium sheets and the species identification was based on *rbcL* sequences and gross morphology, and a phylogenetic analysis was undertaken. In addition to *Porphyra miniata*, *P. thulaea* and *P. umbilicalis*, which were molecularly verified, *P. birdiae*, *P. purpurea* and two unidentified and possibly undescribed taxa were new records in the Greenlandic flora.

“The locus ETOILE is involved in the morphogenesis of the filamentous brown algae *Ectocarpus siliculosus*: cloning the gene by a

map-based approach”

Zofia NEHR, Aude Le Bail, Bernard Billoud, Sophie Le Panse, Bénédicte Charrier

Station Biologique de Roscoff

Abstract

Ectocarpus siliculosus is being developed as a model organism for brown algal genetics and genomics. Brown algae are phylogenetically distant from other multicellular phyla and therefore offer the opportunity to study novel and alternative developmental processes that lead to the establishment of multicellularity. *E. siliculosus* has uniseriate filaments and displays one of the simplest architectures in the Phaeophyceae. The developmental patterning of the young sporophyte has been described and modelised. In spite of the plasticity of the developmental pattern, the morphogenetic steps leading to the development follow rules that underlie local positional information and cell-to-cell communication. The molecular or cellular mechanisms that govern the overall development are not yet elucidated. To address these questions, we created a UVB-mutants collection and isolated the mutant ‘*étoile*’ in which a cell differentiation defect leads to a hyperbranching phenotype. By computational modelling of the mutant developmental pattern, we showed that the phenotype could be explained by a loss of local positional information. Five genes were shown to be under-expressed in ‘*étoile*’ and four of them contain a Lin-Notch domain sharing similarities with metazoan Notch receptor involved in binary cell differentiation, supporting the hypothesis that ‘*étoile*’ is impaired in cell-to-cell communication. ‘*étoile*’ is the first morphogenetic mutant described in *E. siliculosus*. Genetics analysis showed that the mutation is recessive and single-locus. The aim of my project is to identify the *ETOILE* gene by a map-based cloning approach. Map-based (also called positional) cloning is an iterative approach which consists in looking for linkage between the locus responsible of the mutant phenotype and molecular markers whose physical positions in the genome are known. Recently, *E. siliculosus* genome sequence and genetic map have been published, providing useful tools for an efficient cloning. On the other hand, the sequencing of ‘*étoile*’ genome is in progress. Combination of the linkage map of *ETOILE* locus and candidate mutations identified by sequencing will decrease the time-cost of cloning. Identifying *ETOILE* gene will provide new insights to better understand the molecular control of morphogenesis in *E. siliculosus* and more largely in the brown algal group.

“Natural production of volatile organics: the impact of tropical seaweeds and aquaculture”

Emma Leedham, Dr Claire Hughes, Prof. Bill Sturges, Dr. Gill Malin, Fiona Keng & Prof. S.-M. Phang

Laboratory for Global Marine Atmospheric Science, UEA

Abstract

An established body of literature documents the production of halocarbons by marine macroalgae but the majority of this data has concentrated on polar or temperate species. The extent of tropical production is unknown, a problem we feel needs to be addressed. Firstly, short-lived naturally-produced halocarbons can impact the ozone layer if released in the tropics. At low latitudes, deep convection provides a rapid transport mechanism delivering them to the stratosphere before they are broken down. In contrast, the time taken for surface emissions released in higher latitudes to reach the stratosphere is generally greater than the atmospheric lifetime of many biogenic halocarbons. Secondly, aquaculture is commercially important in tropical coastal environments and future expansion is projected with increased demand for current products and novel usage. Malaysian Borneo, for example, has identified over 20,000ha of coastal area that is currently used, or could be used, for aquaculture and there is substantial interest in the use of farmed algae for biofuel production and climate change mitigation. In the same way that terrestrial crop plants are subjected to different conditions and environmental stresses compared to related plants in the wild, so are farmed seaweeds relative to the algae found in natural coastal environments. Such conditions could enhance or reduce the natural production of halocarbons from macroalgae. The aim of this project is to provide some of the first detailed data on emissions from tropical

seaweeds and to then build on this with laboratory and fieldwork looking at possible triggers for enhanced production and emissions by farmed species. This talk will focus on early results from fieldwork in Malaysia where several tropical species were sampled for emissions in situ and in the laboratory. We will also touch on current laboratory tests with locally collected temperate species to investigate the potential effects of seaweed processing, specifically the drying of seaweeds, on halocarbon emissions.

“Environmental stress does not always increase intracellular DMSP and DMS concentration in *Emiliania huxleyi* CCMP1516”

Michelle Fernandes, Daniel Franklin, Roy Bongaerts, Gill Malin
University of East Anglia, Norfolk

Abstract

Blooms of *Emiliania huxleyi* often extending over 100, 000 sq km are responsible for the long-term trapping of carbon in coccolith plates which sink to the ocean floor. In addition, *Emiliania huxleyi* generally contain high concentrations of Dimethylsulphoniopropionate (DMSP) the precursor of Dimethylsulphide (DMS). In the atmosphere, DMS enhances cloud formation influencing climate. Thus *Emiliania huxleyi* may play a significant role on global climate and in the oceanic carbon cycle. Recently, a few studies have been carried out to establish the antioxidant function of DMSP and its breakdown products. Increases in intracellular DMSP (DMSP_p) concentration under stress conditions have been documented in various phytoplankton species and strains, but other studies indicate no increase. We have studied how UV light, nitrate and phosphate limitation, light deprivation and herbicide-induced oxidative stress affect DMSP_p concentrations in *Emiliania huxleyi* CCMP1516. No change in DMSP_p concentration was seen with exposure to UVA + UVB radiation, while nitrate and phosphate limitation decreased DMSP_p concentrations. Light deprived cultures showed a substantial increase in DMSP_p and DMS after 5 days. Paraquat addition (1 mM), which promotes the formation of reactive oxygen species, resulted in up to 30% of cells showing compromised membranes after 72 h, as defined by Sytox-green staining. Flow cytometry revealed 2 cell sub-populations in paraquat treated cells on the basis of red fluorescence and these were sorted and analysed but no increase in DMSP_p concentration was seen in either sub-population. The data suggests that various environmental stresses do not always result in increased DMSP_p and DMS concentration in *Emiliania huxleyi* CCMP1516.

“Regulation of nitrogenase for hydrogen production in the cyanobacterium *Anabaena variabilis*”

Teresa Thiel, Justin Ungerer, Philip D. Weyman, Brenda Pratte
Department of Biology, University of Missouri-St. Louis

Abstract

Cyanobacteria have the potential to produce alternative energy sources using only sunlight for energy, whilst also consuming the greenhouse gas, carbon dioxide. The only waste products from these reactions are water and oxygen. Nitrogen fixation in filamentous, heterocyst-forming cyanobacteria, such as *Anabaena variabilis*, produces both ammonium for cell growth and hydrogen gas as a side product. Although the electrons from that hydrogen are normally recycled by an uptake hydrogenase, mutants that lack this enzyme are able to evolve hydrogen gas. Since this is an energetically expensive process for the cell, the production of ammonium and hydrogen by nitrogenase is tightly regulated. We are taking two approaches to increasing hydrogen production: 1) modifying the enzyme to preferentially produce hydrogen instead of ammonium and 2) modifying the regulation of the nitrogenase genes to increase the amount of enzyme that is made. We found that a V75I amino acid substitution in the β -subunit of nitrogenase showed reduced levels of N₂ fixation but had high levels of hydrogen production. In contrast, another mutant containing a substitution in the α -subunit, V76I, had little effect on enzyme activity. In terms of nitrogenase gene regulation, we have identified key regulatory sites that control the transcription of the complex *nif* operon that will allow us to modify the transcription of these genes. In combination, these genetic approaches should increase hydrogen production, potentially to levels that will make this an economically feasible system for hydrogen production.

“Microsatellite markers for *Phaeocystis antarctica*: assessment of population structure and physiological responses”

Linda K. Medlin, Steffi Gaebler-Schwarz
University of Pierre and Marie Curie

Abstract

To assess population structure and biogeography of the Antarctic keystone species *Phaeocystis antarctica*, we established Amplified Fragment Length Polymorphisms and developed species specific microsatellite markers. Both tools revealed a high genetic diversity among *P. antarctica* populations originating from different ocean regimes. Eight new microsatellite loci for *Phaeocystis antarctica* were used to genotype 89 strains isolated from all Antarctic gyres. Number of alleles for the eight loci ranged from five to 25. The mean observed and expected heterozygosities ranged from 0.425 to 0.804 and 0.681 to 0.905, respectively. Gene flow around the Antarctic continent was mediated by the ACC. Flow out of the Weddell Sea was limited, although genotypes from other regions were found among Weddell Sea isolates. Genetic diversity was correlated with physiological responses, which in turn was correlated the geographical origin. A new cell stage, interpreted as a zygote, thus completing the sexual stage in the haplo-diploid life cycle of *P. antarctica* was discovered. *P. antarctica* is a species that continuously adapts while it is evolving and successfully surviving in the harsh environment of the Southern Ocean.

“The photophysiology of stromatolite microbial communities”

Dr Rupert Perkins, J-L. Mouget, J. Kromkamp, J. Stolz, and RP. Reid

Cardiff University

Abstract

Stromatolites are organosedimentary structures with photosynthetic communities dominated by cyanobacteria within the stromatolite fabric itself, but colonised by eukaryote phototrophs, principally diatoms, on their surface. The photosynthetic sub-communities within stromatolite “classical” mat types (Types 1, 2 and 3 following Reid et al. 2000 and Stolz et al. 2009), and the surface eukaryote communities (following Stolz et al. 2009) were analysed with regard to their productivity and photoacclimation state using pulse amplitude modulated variable chlorophyll a fluorescence. Sub-samples were excised from stromatolites at Highborne Cay, Bahamas, and cross-sectioned to enable both surface near surface and sub-surface photosynthetic sub-communities to be analysed simultaneously using rapid light response curves measured with a Walz Mini-PAM imaging fluorimeter. Light curve parameters and induction of non-photochemical quenching (NPQ) showed clear differences between stromatolite mat types as well as between sub-communities within mat types. In general data showed differences which agreed with the accepted quazi-succession of “classical” mat types, with greater productivity shown by cyanobacteria (e.g. *Schizothrix gebeleinii* and *Solenia* sp. as well as more complex mixed communities) in Type 1 mats and the hypothesised climax communities within Type 3 mats, with lower productivity within Type 2 mats in which greater bacterial activity is thought to occur. Eukaryote mat types, dominated by stalked (*Striatella* sp. and *Licmophora* sp.) and tube dwelling taxa (e.g. *Nitzschia* and *Navicula* spp.) generally showed greater photosynthetic productivity than the cyanobacteria sub-communities, with the exception of low productivity for *Striatella*, and high productivity for a non-identified coccoid cyanobacterium. Overall data support the role of both photosynthetic groups, prokaryotes and eukaryotes, in stromatolite productivity and, along with existing knowledge of polymer types produced by the sub-communities, support the dominant structural role of the cyanobacteria.

“Defining reference diatom assemblages for European streams and rivers”

Martyn Kelly

Bowburn Consultancy, Durham

Abstract

The EU Water Framework Directive requires ecological status to be expressed as the ratio between observed and expected values of biological parameters. Expected values should be derived the values of these parameters at reference conditions applicable to that water body. In order to ensure comparability of monitoring results, the WFD also



obliges member states to participate in an intercalibration exercise. The first phase of this exercise demonstrated wide variation in the interpretation of “reference conditions” across the EU and this has become a major focus of the second phase of intercalibration. This talk describes efforts to define a workable reference concept for benthic diatoms in rivers that is applicable across Europe. An important stage of this process has been taxonomic harmonisation, in order to ensure that apparent differences between member states are not a by-product of different identification conventions. Once taxonomic harmonisation was complete, data from sites which met a priori screening criteria for reference conditions were subjected to multivariate analyses in order to define a simple typology. This typology was then used to define metric values and narrative standards consistent with reference conditions. These criteria could then be used to validate candidate reference sites for which full screening data were not available, and to help define alternative benchmarks for stream types which lack verifiable reference sites.

“Effect of sonication on two natural field blooms of predominantly unicellular and filamentous green algae”

Dr. Diane Purcell, Simon A. Parsons, Bruce Jefferson
National Oceanography Centre, Southampton

Abstract

Natural algal blooms are prolific throughout water sources worldwide. They vary in shape, size and toxicity. These field blooms have been documented to block filters increasing backwashing in water treatment works. Two natural blooms from the South of England were treated with 20 and 28 kHz of ultrasound at laboratory and pilot scale. The first bloom was composed of mixed species dominated by unicellular green species i.e. *Sphaerocystis* sp. and *Scenedesmus* sp., the second bloom was composed of mixed species with dominance of filamentous green species including *Tribonema* sp. The first trial saw complete kill of the dominant species *Sphaerocystis* sp. and *Scenedesmus* sp. in the last 8 days of the trial, conversely the second trial using the same field bloom but 30 days older saw *Scenedesmus* sp. the dominant species with growth rates significantly exceeding the control by 100,000 cells.mL⁻¹ or 25%. In the third trial a new field bloom dominated by filamentous green species was used and resulted in cell removal rates of >90% by the final day of the trial. The fourth trial used the filamentous bloom but it was 30 days older and enhanced growth of filamentous bloom with the test tank exceeding the control tanks growth levels for the majority of the trial by over 100,000 cells.mL⁻¹. Laboratory experiments using the filamentous bloom at 60 days old found insignificant decrease in cell number using 20 kHz ultrasound. Chlorophyll fluorescence results confirmed the cell count results over the majority of the trials. These results indicate that the age of the bloom has a significant input on effectiveness of ultrasound, the older the bloom the lower the effectiveness of ultrasound, neither morphological type unicellular or filamentous were more susceptible in these trials.

“MIDTAL (microarrays for the detection of toxic algae)”

Jixin Chen, Linda K. Medlin, Wiebe Kooistra, Edna Graneli, Beatrix Reugera, Robin Raine, Bente Edvardsen, Jane Lewis, Chris Elliott, Yolanda Pazos, and Lucie Maranda
Marine Biological Association, Plymouth

Abstract

Microalgae in marine and brackish waters of Europe regularly cause harmful effects, considered from the human perspective, in that they cause economic damage to fisheries and tourism. Cyanobacteria cause similar problems in freshwaters. These episodes encompass a broad range of phenomena collectively referred to as «harmful algal blooms» (HABs). For adequate management of these phenomena, monitoring of microalgae is required. However, the effectiveness of monitoring that it is time consuming and morphology as determined by light microscopy may be insufficient to give definitive species and toxin attribution. In the EU FP7 project MIDTAL (microarrays for the detection of toxic algae) we will target rapid species identification using rRNA genes as the target. These regions can be targeted for probe design to recognize species or even strains. We are also include antibody reactions to specific toxins produced by these microalgae because even when cell numbers are low,

toxins can be present and can be accumulated in the shellfish. Microarrays are the state of the art technology in molecular biology for the processing of bulk samples for detection of target RNA/DNA sequence. Existing rRNA probes and antibodies for toxic algal species/strains and their toxins will be adapted and optimized for microarray use. The purpose of MIDTAL is to support the common fisheries policy, aid the national monitoring agencies by providing new rapid tools for the identification of toxic algae and their toxins so they can comply with ECC directive 91/1491/CEE that can be converted to cell numbers and reduce the need for the mouse bioassay.

Poster Abstracts

Monitoring of cdk expression for a better understanding of esv-1 induction in *Ectocarpus siliculosus*

Cecilia Balestreri, Graham Thomas & Declan C. Schroeder

Ectocarpus siliculosus is a filamentous brown alga that is infected by an integrating DNA virus, EsV-1. Consequently, EsV-1 lies ‘hidden’ for long periods of time where the virus DNA becomes associated with the DNA of its host, being replicated alongside it. Viral infection only proceeds in reproduction organs (collectively known as zoidangia) which produce pathological symptoms of deformed viral filled zoidangia (overt symptoms) instead of spores or gametes. The timing of viral synthesis is tied into the mitotic/meiotic cell-cycle associated with spore and gamete (zoids) production. The life cycle of a cell leading to its division and duplication, consists of four phases: G1 (gap), S (synthesis), G2 and M (mitosis). The progression of a cell-cycle is catalyzed by two classes of regulatory molecules: cyclin-dependent kinases, CDKs, which are activated by a special class of proteins called cyclins. Cyclins form the regulatory subunits and CDKs the catalytic subunits of an activated heterodimer. CDK substrates interact with multiple sites on the CDK-cyclin complex. Cyclins are specific for every CDK-substrates and this specificity contributes to the ordering of events.

The cyclin-CDK complexes are involved in each phase of the cell cycle. In particular, mitotic cyclin-CDK complexes, which are synthesized but inactivated during S and G2 phases, promote the initiation of mitosis by stimulating downstream proteins involved in chromosome condensation and mitotic spindle assembly. The recent sequencing of the *Ectocarpus siliculosus* genome has revealed a number of CDKs (ref- Cock et al. *Nature* 2010 & Bothwell et al *New Phytologist* 2010). The aim of this project is to use CDK expression, combined with a cell cycle assay developed in our laboratory to determine the timing of EsV-1 induction in relation to cell cycle events.

Assessing genetic variation among three *Sargassum* species in Oman Sea by using morphological and molecular markers

Somaye Ghasemzadeh Barki, Zahra Noormohammadi, Masoud Sheidai, Farnaz Rafiei

Sargassum species are one of economically important brown algae in south of Iran. Recently 7 *Sargassum* species reported in Sistan & Baloochestan seashore (Oman sea). In this study, morphological and molecular variations were assessed in three *Sargassum* species; *Sargassum tenerimum* J. Agardh, *Sargassum glaucescens* J. Agardh and *Sargassum ilicifolium* C. Agardh, widely distributed species in the southwest of Iran (Oman sea). We investigated ten measurable and ten categorical morphological parameters from three localities; Chabahar, Gwader and Tang seashore. ANOVA test performed among populations of each species as well as between species showed significant difference ($p < 0.01$) for all quantitative characters used. RAPD markers were used to assess genetic variation within populations of each 3 species. Four of 30 RAPD primers produced reproducible bands with high polymorphism (>96%). All populations in 3 species showed unique alleles made unique profiles for them. Different clustering like UPGMA and Neighbor Joining separated populations of each species studied based on measurable characters while both measurable and categorical characters have main rules in differentiation of three species. RAPD data could also group 3 *Sargassum* species separately. Dendrograms based molecular markers confirmed morphological clustering by Mantel test. This is the first study

on evaluation of inter-population variation of *Sargassum* species in Iran.

The influence of algal toxins on copepod feeding behaviour

Kathryn Cook, Ana Amorim, Shona Kinnear, Jean-Pierre Lacaze, Elizabeth Turrell and Eileen Bresnan

The genera responsible for the production of toxins associated with paralytic, diarrhetic and amnesic shellfish poisoning (PSP, DSP and ASP) are routinely detected as part of the phytoplankton community in Scottish waters. Copepods are a critical link in marine food webs between phytoplankton and higher trophic levels, and many harmful algal toxins can affect copepod feeding, mortality and recruitment rates. There are two primary methods by which algae can transmit their toxins to copepods: by active release into the surrounding medium (dissolved toxins), or by passive release during cell damage through grazing (ingested toxins). Analysis of historic data from the Stonehaven monitoring site in the North East of Scotland identified five copepod species potentially vulnerable to influences from toxin producing phytoplankton genera. Direct exposure to dissolved PSP, DSP and ASP toxins at ecologically relevant and elevated concentrations, had no effect on the survival of any of the copepod species studied. Copepod feeding behaviour on PSP toxin producing *Alexandrium tamarense* (Group I strain) was species specific. *Temora longicornis* and *Centropages* spp. fed on all strains of *A. tamarense* regardless of toxicity whilst *Acartia* spp. and *Pseudocalanus elongatus* avoided all *A. tamarens* strains. *Calanus* spp. seem able to distinguish and avoid toxic *A. tamarense* but ingested non-toxic strains. These differences in feeding behaviour could affect copepod growth rates, and therefore have implications for the pelagic ecosystem productivity.

Cultivation of *Laminaria digitata* in Ireland.

Edwards, M., O'Mahony, F., Werner, A., Watson, L. and Dring, M.J.

During the past decade in Ireland, a number of cultivation methods have been developed for some commercially important seaweeds. Previous efforts have concentrated on the red alga *Palmaria palmata*, and the brown alga *Alaria esculenta*. Current research continues with the cultivation of *Laminaria digitata* as part of the Seaweed Hatchery Project. This is an all-Ireland effort to grow seaweed on a pilot or commercial scale and is accomplished by the establishment of three seaweed hatcheries and multiple cultivation sites at sea. Results will be presented of the growth of *Laminaria digitata* during some of the sea trials. Recommendations from a desk-study on the selection of sea cultivation sites will also be presented, based on a case study in Bantry Bay, Co. Cork.

Effect of non-biocidal coatings on attachment and adhesion strength of *Ectocarpus*.

Emmanuelle Evariste, Claire Gachon, David Williams, Gabrielle Prendergast, Maureen Callow, James Callow

For decades, numerous studies have been performed in order to understand and to find solutions to control marine biofouling, which is an accumulation of marine organisms on structures submerged in seawater. New technologies are being investigated to prevent fouling including the use of non-biocidal, "fouling-release" coatings. Numerous studies have shown that these coatings decrease the adhesion of higher organisms, including seaweeds such as *Ulva*. However, other seaweeds, including *Ectocarpus*, are reported to be able to colonise and adhere to non-biocidal fouling-release coatings on test panels and ships' hulls. Some previous studies showed that *Ectocarpus* spores and filaments may have specific surface preferences but no specific adhesion bioassays are currently available. This abstract reports the development of a protocol in order to investigate the growth and the adhesion strength of filaments of *Ectocarpus crouaniorum*. Results show that growth rate, initial attachment and adhesion strength varied according to the type of coating. Filaments adhesion strength was lowest on hydrophilic, high surface energy coatings and particularly low on the amphiphilic, commercial coating Intersleek® 900.

A first morphometric and molecular approach to the phylogeny of blue diatoms from the genus *Haslea*

Romain Gastineau, Boris Jacqueline, Vincent Leignel, Aurore Caruso, Yann Hardivillier, Pierre Gaudin, Yves Rincé, Catherine Tardy-Laporte,

Lorine Bounous, Gert Hansen, Angela Wulff, Nikolai Davidovich, Eileen Cox, Jean-Luc Mouget

The genus *Haslea* of diatoms is well known due to the species *Haslea ostrearia* that produces a blue pigment called marennine. This peculiar pigment accumulates at the apices of the cells before being released in seawater. In oyster ponds, where *H. ostrearia* can form blooms, marennine is responsible for the greening of oysters' gills. Presently, 26 different species constitute the genus *Haslea* (as defined by Simonsen, 1974) and *H. ostrearia* is considered as the only species of this genus able to produce the peculiar blue pigment. We analysed, using molecular and morphological approaches, the biodiversity and the phylogeny of diatoms with blue apices isolated in different geographic areas. Presently, apart from *H. ostrearia* sampled in the French Atlantic Sea and in Swedish coast, other blue diatoms were sampled in the Canary Islands, in the French coast of the Mediterranean Sea, and in the Crimean shores of the Black Sea. All these organisms belong to the genus *Haslea*, but they differ in their morphology and the pigment they produce. Also, they cannot interbreed so they are presumed to be different species. Therefore, the phylogenetic relationships between these blue diatoms and four other species of *Haslea* without blue pigment were studied. Three different molecular markers have been sequenced, the nuclear ribosomal region [ITS1-5.8S-ITS2], the chloroplast gene *rbcL* and the mitochondrial gene *cox1*. The phylogenetic trees (MP, BAY, NJ) obtained with the different markers (ITS, *rbcL*, *cox1*) shared similar topologies. All "blue" species formed a robust cluster, and within this cluster, the links between species are related to their respective biogeographical origin.

Assessing genetic variation among three *Sargassum* species in Oman Sea by using morphological and molecular markers

Quantifying the climate change response of desmid diversity in Scotland's blanket mires

Emma M. Goodyer, David G. Mann, Hans Sluiman, Martina M. Burtscher, Stuart W. Gibb

The role of biodiversity in ecosystem function is widely acknowledged, however little is known about the diversity of desmids on a nationwide scale, and the sensitivity of the desmid community to changes in environmental drivers. Field observations and experimental studies show that most desmid species are ecologically sensitive and require specific chemical conditions for growth. At present their application as potential biomonitors is complicated by an under resolved taxonomy and a distinct lack of specialists in the field. Desmid diversity is at its richest in intact peatland systems which provide a range of acidic, nutrient poor microhabitats. However peatland biodiversity is threatened by a whole host of anthropogenic impacts such as land drainage and climate change. The predicted climatic response of vascular plants and mammals suggests that species will move their range northwards and altitudinal ranges will shift upwards. In contrast, the climatic response for microbial communities is significantly under researched, although due to the dependence of blanket bog on consistently high inputs of precipitation, desmid species may be expected to shift their range in a more north-westerly direction to escape the effects of rising temperatures and to follow shifting patterns of precipitation.

Bacterial induction of algal morphogenesis in *Ulva mutabilis* in the lagoon Ria Formosa (Portugal): A bioassay guided approach

Jan Grueneberg, Aschwin Engelen, Rodrigo Costa & Thomas Wichard
In the marine environment macroalgae are continuously challenged by microbes searching for nutrients and a surface on which to settle. It was found that specific bacterial populations colonise algal surface, although bacteria are homogeneously distributed in the seawater. Therefore, it appears that the macroalgae influence their associated bacterial communities in order to benefit from them.

Here, we present studies of bacteria inducing the morphogenesis of the green macroalga *Ulva mutabilis* Føyn (collected in Faro, Portugal). In laboratory experiments we can inoculate defined seawater medium with axenic gametes of *U. mutabilis* without the addition of antibiotics. It is known that *Ulva* is not able to grow without certain bacteria. Interestingly, two isolated strains can functionally replace the bacterial flora of *U. mutabilis* and induce readily its morphogenesis when added to



axenic gametes. The use of axenic gametes in a standardised bioassay allows us to determine which bacteria release morphogenetic active compounds (morphoinducers). Using a combined approach in analytical chemistry and microbiology we aim to understand the morphogenesis-inducing mechanisms.

We conducted field experiments in the Ria Formosa (Portugal) to study the ecological significance of our laboratory observations. Indeed, using axenic cultures of *U. mutabilis* we found morphogenetic activity in sterile-filtered seawater from the lagoon's tide pools. First we performed DGGE for comparison of the bacterial communities on algal surfaces and in the surrounding water. Afterwards we have isolated bacteria from the surface of *Ulva* and from the seawater of its natural habitat. Our bioassay guided screening revealed known and novel morphotypes induced by certain of these isolated strains. Mass spectrometric analysis and purification of morphoinducers will help to understand the interaction of the macroalga and its bacteria. A comparison of the 16S rDNA sequences aims to investigate whether this ability is widespread among bacteria or restricted to just a few species.

Freshwater Diatom Flora of the British Isles

Ingrid Jüttner, Eileen J. Cox, Martyn Kelly, David G. Mann, David M. Williams

This poster outlines a new project which aims to produce a freshwater diatom flora for Britain and Ireland. Approximately 2800 species of freshwater diatoms have been recorded from Britain and Ireland. During ongoing ring tests involving a diatom expert panel and colleagues at the Environment Agencies in England, Scotland, Wales, Northern Ireland and Ireland, problems with the identification of certain species and species groups occurred regularly. This led to a proposal that an updated diatom flora should be prepared. The flora will include photographic documentation of all known taxa using light and scanning electron microscopy, a key to the genera, and ecological information, including geographical distribution, for all taxa for which data are available. Each taxonomic group will be investigated by an expert and, if necessary, new taxa will be described and published in peer-reviewed journals prior to the publication of the flora.

In addition a web-based taxonomic tool for diatom identification hosted by the National Museum of Wales will be produced and a printed book will be published once all taxonomic groups have been reviewed. The online identification guide will be a database-driven dynamic website. The database will house taxonomic and ecological information, species descriptions for new species, bibliographic references, and images for each species. From these data, individual species accounts will be provided that will enable experts and non-experts to identify species accurately. The website will also provide the interface to allow specialist external editors to access for editing of species specific information and to upload images.

The new flora will help taxonomists and ecologists as well as staff working for agencies and organisations monitoring water quality and biological diversity to identify all freshwater diatom taxa occurring in Britain and Ireland.

The effects of ocean acidification on coralline algae (Rhodophyta) in northeastern Atlantic coastal waters.

Stefan Kolle, Juliet Brodie, Rupert Perkins and Marian Yallop

Global oceanic pH levels are expected to fall by 0.3 units over the next 100 years, with potentially major impacts on marine calcifying communities. Coralline macroalgae, with their highly-soluble high-Mg carbonate skeletons are likely to be among the first affected organisms. The aim of this PhD study is to address the complexity involved in studying the responses of this ecologically important algal group to ocean acidification. One major problem is the lack of taxonomic resolution in this group, leading to widespread misidentification, jeopardizing study-comparability as well as potentially hiding ocean acidification responses at species level. To address this problem, molecular and morphological identification training is taking place at the Natural History Museum in London, with special reference to the red calcified geniculate (articulated) genus *Corallina*. The Museum's collection will enable comparative research into skeletal structure of *Corallina* from pre-industrial times to the present. To assess potential

impacts of ocean acidification, the effects of elevated sea water CO₂ concentration will be tested in conjunction with other stress factors, notably light. Photosynthetic responses in *Corallina* will be tested under laboratory conditions as well as in the field on a northeastern Atlantic scale. Furthermore, changes in the dynamics of coralline algae and their associated biofilms will be studied.

Algal Biotechnology for Wales Knowledge Transfer Centre

Robin Shields, Kevin Flynn, Robert Lovitt, Adam Powell, Alla Silkina.

Applied microalgal research at Swansea University, via the Algal Biotechnology for Wales KTC aims to utilise phytoplankton and exploit their properties for economic and environmental gain. Our multidisciplinary team believes that three main industrial sectors can be assisted across Wales and the UK, via an integrated biorefinery approach for ameliorating waste and creating valuable end products.

Waste producers (Industry, power stations, incinerator and anaerobic digester operators, food producers and processors, sewage farms) - Surplus carbon dioxide, nitrogen species and micronutrients can be scavenged and utilised to remediate wastes and provide alternative, sustainable and discrete solutions to waste management.

Infrastructure providers (algal growth systems, lighting, pumping, filtration, process control, analytical instruments, plastics and metals) - Cultivated algal biomass requires optimal growth systems and harvesting techniques, providing new markets for emerging and established enterprises.

Product end users (Pharmaceutical, cosmetics, nutrition, biofuels) - Microalgae is a sustainable feedstock providing raw or refined algal biomass for a wide variety of bulk and high value products.

The KTC team at Swansea consists of staff and facilities at the Centre for Sustainable Aquaculture Research (CSAR) and Centre for Complex Fluids Processing (CCFP).

This includes two 600L algal growth systems ("photobioreactors" or PBRs), currently the largest publicly accessible facility of its kind in the UK. In addition, we possess an array of processing and analytical equipment, mathematical modelling expertise and advice, demonstration and training opportunities.

We welcome enquiries from private, public and academic enterprises.

Antibacterial activity of marine bacteria isolated from seaweeds, sand and seawater

M.L. Prieto, L. O'Sullivan, S.P. Tan, P. Duggan, P. McLoughlin, H. Hughes, P.G. Lawlor & G.E. Gardiner

Due to the emergence of antibiotic-resistant bacteria, there is a demand for new antibacterial agents. Seaweed surfaces are colonised by diverse microbial communities, which play a role in inhibition of predators and biofouling. Therefore, seaweed-associated bacteria could potentially be exploited as a source of novel antibacterial compounds. The objective of this study was to examine antibacterial activity of culturable epiphytic (surface-attached) bacteria from a range of Irish seaweeds, as well as bacteria from sand and seawater. Samples were plated on a range of culture media and spore-forming bacteria, known for the production of antibacterial compounds, were also isolated by heating samples to 80 °C for 15 min prior to plating. Initially, more than 6,000 colonies isolated from seven seaweeds, one seawater sample and one sand sample, were screened for antibacterial activity against *Escherichia coli*, *Salmonella Typhimurium*, *Listeria innocua*, *Bacillus subtilis* and *Staphylococcus aureus* using an agar overlay method. Nineteen isolates with antibacterial activity against at least one of these indicator bacteria were isolated and their activity was confirmed against a range of pathogenic and non-pathogenic bacteria. All antibacterial-producing bacteria were identified as *Bacillus* spp. by 16S rRNA gene sequencing, confirming the genus as an antibacterial producer. The antibacterial compounds are currently being characterised and data demonstrating sensitivity to proteolytic enzymes indicate that some are likely to be bacteriocins, ribosomally synthesised antibacterial peptides. Additional studies examining heat stability of the antibacterial compounds revealed that some retain activity following heating to 121°C for 15 min. Overall, this study demonstrates that bacteria isolated from seaweeds produce compounds with promising antibacterial activity against pathogens, such as methicillin-resistant *S. aureus* (MRSA), *E. coli* and *Salmonella*. Future work

will involve additional characterisation and identification of the antibacterial compounds produced by the marine bacteria.

The Distribution of *Cylindrotheca closterium* and *Navicula perminuta* in the differentiation of salinity concentrations.

Supattira Pruetiworanan and Graham J. C. Underwood

Communities are characterized not only by the mix of species but also by physical features of the biotic and abiotic environment. A community can be composed of a small number of common species or it can have a wide variety of species, some common with high population density, but most relatively rare with low population density. The aim of my work is to investigate the reasons why some diatoms community types are changed under different conditions in river and estuarine systems. Growth experiments were carried out to test the hypotheses that salinity concentrations might have caused a variation in growth rate of the estuarine benthic diatoms and this work was carried out between March 2010 and June 2010. Cultures of the benthic, pennate diatoms *Navicula perminuta* and *Cylindrotheca closterium* were selected from the University of Essex culture collection. Cell division rates, photosynthetic efficiencies and chlorophyll a analysis were analyzed in replicated plates at 5, 20 and 35‰ salinity with F/2 medium in 24 h light cycle at 20°C. There was a significant positive relationship between the cell density and chlorophyll a. Chlorophyll a concentrations varied in 0.031-1.540, 0.007-0.726 and 0.120-1.248 µgChl.a/ml of *C. closterium*, *N. perminuta* and mixed cultures respectively. The highest maximum specific growth rate of *C. closterium* was presented in 35‰ salinity whereas *N. perminuta* was in 20‰ salinity. In mixed cultures, there were clearly high maximum specific growth rates in *C. closterium* for all of salinity concentrations when compared with *N. perminuta*. The photosynthetic efficiency of 30 minutes dark-adapted cell (Fv/Fm) was nearly the same value in all of conditions and genera (approximately Fv/Fm = 0.6). The distribution of estuarine benthic diatoms was consistent with high salinities.

Composition and temporal variation of the algal assemblage associated with the sponge *Haliclona indistincta* (Bowerbank)

Mónica B.J. Moniz, Fabio Rindi, Kelly Stephens, Carsten Wolff and Grace McCormack

Algae and sponges coexist in many marine and freshwater environments and establish a wide range of interactions. It has been recognized that in certain habitats algal-sponge interactions have a great ecological significance. To date, however, only a few studies have analysed in detail the diversity of the algal assemblages associated with sponges. We examined the composition and temporal variation of the algal assemblage associated with a population of *Haliclona indistincta* (Demospongiae, Haplosclerida) at a sheltered site on the western Irish shore (Corranroo, Galway Bay). Thirty individuals of *H. indistincta* were collected each month for a complete annual cycle (September 2009-August 2010). The algal epibionts were removed and identified morphologically. In the course of the study 63 species of macroalgal epibionts were recorded. Overall, the algal assemblage was most diverse and best developed in the period late winter-early spring 2010. The highest species richness was recorded in April 2010, when 39 species were found; at this time the highest mean number of algal species per sponge individual was also recorded. There was considerable variation between different sponge individuals in terms of algal coverage and diversity; 13 algal species was the highest number recorded on an individual sponge. The red algae *Rhodothamniella floridula*, *Gelidium spinosum*, *Corallina officinalis*, *Lomentaria clavellosa*, *Gastroclonium clavatum* and *Rhodophyllis divaricata*, and the green *Ulva* cf. *lactuca* were the most common species found associated with *H. indistincta*. Whereas most algae were epibiotic on *H. indistincta*, larger-sized species (such as *C. officinalis* and *G. clavatum*) appeared to be primarily epilithic algae which got entrapped in the sponge tissues upon sponge growth. Most algal species did not appear to be specifically associated with *H. indistincta* and were also observed on abiotic substrata at the sampling site.

A novel accurate method for assessing contaminant tolerance in the model brown alga *Ectocarpus siliculosus*

F. Roncarati, M.T. Brown

Brown seaweeds explicate a very important ecological role as pre-

eminent primary producers, key bio-engineers and components of biofouling communities of temperate coastal waters. Moreover their ability to grow in metal-polluted waters makes these algae particularly interesting in the context of water quality studies and pollution monitoring.

Ectocarpus siliculosus has been recently accepted as a model organism for brown algae and with the sequencing of its genome now complete there is an unprecedented opportunity to investigate the patterns of gene expression and cellular responses in different generation of tolerant and non-tolerant strains in response to metal exposure. Here we present the results of the first stage of a project that will use an interdisciplinary approach combining ecotoxicology and genomics.

A novel and accurate method has been developed to assess copper tolerance in geographically separated strains of *E. siliculosus* collected from pristine and polluted sites. Only elongated cells of upright filaments (URF) isolated from sporophyte generation were used as target cells and exposed to increasing copper concentrations. Copper effects on the growth of individual fragments of UPR of 10-14 cells long have been measured as change in length, cells, branches and rhizoids number. This easy and relatively quick method (changes evident after few days) allows studying the development of elongated cells when exposed to copper (or other contaminants) and it is very precise as comparisons between strains are based on observed effects on the same type of target cells.

The tolerant and non-tolerant strains of *E. siliculosus* identified with this method will be used in further experiments to evaluate and compare metal effects on cellular responses, glutathione and phytochelatin content and the expression patterns of specific genes.

Impact of two herbicides, glyphosate and chlorotoluron, on river biofilm communities

Rosenkranz H., Anesio A.M., Kelly M.G., Yallop M.L.

Our current understanding of the effect of pesticides on microbes (algae and bacteria) is limited, with more focus on selected planktonic species, rather than benthic species. In addition most toxicity tests for assessing pesticide impacts are conducted on single uni-algal cultures, rather than testing community level responses.

The main focus of the project is to investigate how changes in pesticide levels affect biofilms in rivers with a specific focus on Chlorophyceae, Bacillariophyceae and Cyanobacteria along with associated bacteria and viruses.

Two herbicides, glyphosate and chlorotoluron, were used to investigate their single and synergistic impacts on the biomass, biodiversity and photosynthetic responses of stream biofilm assemblages by conducting both, field and laboratory experiments during the summers of 2009 and 2010.

A significantly lower periphyton biomass (dry weight, ash-free dry weight and chlorophyll *a*) was found in biofilms treated with glyphosate compared to controls, while no significant differences were found between the biomass of periphyton exposed to chlorotoluron and untreated biofilms. Differences were recorded in the biomass-specific photosynthetic rate of the autotrophic assemblage following glyphosate treatment compared to controls, but no significant impacts were measured in chlorotoluron treated biofilms compared to non-amended biofilms.

Within the photosynthetic groups, Bacillariophyceae showed a greater sensitivity to glyphosate, in comparison to Cyanobacteria and Chlorophyceae, with a significant decrease in their relative abundance in treated biofilms compared to controls.

The ratio of bacterial numbers to chlorophyll *a* and dry weight increased compared to controls, following herbicide treatments. Using a modified Autotrophic Index (dry weight chlorophyll *a*⁻¹) a shift from an autotrophic to a more heterotroph dominated community was recorded.

GPA, a calcium binding protein: Its potential role in biomineralization

C. Singleton, S. J. Ripley, M. D. Iglesias-Rodriguez, C. Brownlee, D. Schroeder

The precise nature of the calcium carbonate (CaCO₃) biomineralisation process remains unclear in coccolithophores. Ordered organic matrices



have none the less been discovered associated with CaCO₃ crystals in many of the species studied. Coccolithogenesis in the coccolithophore, *Emiliana huxleyi*, is thought to be a good example of CaCO₃ biomineralisation and this, combined with its likely role in control of oceanic biogeochemistry, makes it an ideal organism to study. Coccoliths are generated intracellularly in a Golgi-derived reticular body, known as the coccolith vesicle. An organic baseplate is formed early in coccolith development onto the rim of which CaCO₃ crystals are nucleated in an ordered way. Acidic-proteins and polysaccharides have been isolated from coccoliths and are thought to be intrinsically involved in the assembly of the crystals.

Work undertaken by Corstjens et al (1998) led to the discovery of GPA, a protein with an amino acid sequence resembling the Ca²⁺-binding loop of EF-hands. They also demonstrated the ability of this protein to bind Ca²⁺ in vitro. Early efforts in our own laboratory, to further elucidate the role of this protein, have highlighted a correlation between different coccolith morphologies (A, B, C, A-overcalcified and R morphotypes) and variations in coding regions of the gpa gene. This project will be investigating the Ca²⁺-binding properties of GPA and looking at the potential of GPA to control CaCO₃ crystal growth in vitro. Experiments will be carried out to further elucidate structural details of the protein.

Hunting covert viruses in filamentous brown algae

Kim Stevens, Murray T. Brown, Colin Brownlee, Declan C Schroeder

Populations of the small filamentous brown alga *Ectocarpus siliculosus* across the world are commonly infected by a nucleocytoplasmic large DNA virus (NCLDV), EsV-1, which integrates its genome into that of the host. Similar viruses have been found in related algae such as *Feldmannia irregularis* and *Hincksia hincksiae*, and all have a deleterious effect on the reproduction of their respective hosts.

Often, these infections are silent, since although the virus is present and can be detected by genetic means, symptoms are rarely visible. This situation is exacerbated in laboratory strains maintained at higher temperatures (18°C as opposed to 15°C), whereby symptoms are greatly suppressed.

Molecular techniques have been used to assess the host range of these viruses, in a bid to elucidate their potential effects on brown algal populations. DNA sequencing of genes common to these viruses will provide an understanding of their evolution, potentially allowing an insight into their co-evolution with their hosts. Furthermore, an improved knowledge of viral infection mechanisms will inform predictions of the effects of climate change, and in particular rising sea surface temperatures, on populations of these algae.

Isolation and characterisation of antibacterial phytochemicals from green and red seaweeds harvested from the Irish coastline.

S. P. Tan, L. O'Sullivan, M. L. Prieto, G. E. Gardiner, P. Duggan, P. G. Lawlor, P. McLoughlin, H. Hughes

The emergence of antibiotic-resistant bacteria, such as methicillin-resistant *Staphylococcus aureus* (MRSA), has resulted in a need to identify novel antibacterial agents. Seaweeds contain a vast array of phytochemicals which are reported to have a wide range of biological activities, including antibacterial activity. Furthermore, seaweeds grow in relative abundance along the Irish coastline and are considered a sustainable natural resource. The aims of this research were, firstly, to examine antibacterial activity of extracts generated from seaweed species which are indigenous to the South-East coast of Ireland, and secondly, to isolate and characterise the compounds responsible for in vitro antibacterial activity. Initially, 56 extracts were generated using a range of solvents with varying polarity and these were tested in vitro for activity against a range of pathogenic and non-pathogenic, Gram positive and Gram negative bacteria using a disc diffusion assay. Twenty five extracts demonstrated antibacterial activity against at least one bacterial species and two extracts were chosen for further investigation. G2F, an extract generated from a green seaweed species with a neutral solvent produced inhibition zones against *Bacillus subtilis* ATCC 6633 (12 mm) and MRSA W73365 (7.5 mm). Two bioactive compounds were separated from the crude extract using a combination of bioautography, preparative thin-layer chromatography and column chromatography. These bioactive compounds are currently being identified. In addition, a second extract

R1A, from a red seaweed species also demonstrated a promising zone of inhibition against MRSA W73365 (18 mm) and is currently being investigated. This study demonstrates that green and red seaweeds harvested from the Irish coast contain compounds with promising antibacterial activity which could potentially be used against human antibiotic-resistant organisms, such as MRSA. Future work will involve additional characterisation and identification of the antibacterial compounds found in the extracts displaying bioactivity.

Caulerpa racemosa; Spatial and Temporal Distribution in the East Aegean Sea.

Christopher Williamson, Anastasia Miliou, Rupert Perkins.

Caulerpa racemosa var. *cylindracea* (from here *C. racemosa*), an invasive green macroalgae originating from Western Australia, has colonised the coasts of 12 countries and all major islands around the Mediterranean Sea over the last 19 years. Spreading via fragmentation, sexual reproduction, and production of propagules, it is able to inhabit a wide range of subtidal substrata from 0 to 70m depth, resulting in significant decreases in cover, number and diversity of native macroalgae species, shifts in native invertebrate species compositions, and negative impacts on benthic feeder fish and ecosystem responses to disturbance.

Despite being regarded as more serious, relatively little research has been conducted on the invasion of *C. racemosa* in comparison to other well documented invaders, e.g. *C. taxifolia*. There exists an urgent need for rigorous studies evaluating *C. racemosa*'s long-term impacts in different habitats and regions of the Mediterranean. The present study will therefore assess the temporal and spatial distribution of *C. racemosa* in the East Aegean Sea, an area rich in important Mediterranean species, e.g. *Posidonia oceanica* sea grass beds, yet increasingly susceptible to biological invasions.

C. racemosa percent cover, biomass, morphometric plasticity, photosynthetic efficiency and affinity for inorganic nutrients shall be assessed across a range of depths, substratum types and disturbance regimes, around several East Aegean Islands, in correlation to seasonal changes in temperature, light and inorganic nutrient availability. Examination of native macroalgae, invertebrate and fish communities between invaded and non-invaded sites will further demonstrate the effects of invasion on the diversity and functionality of the area. Lastly, manipulative temperature, light, nutrient, and grazing incubations shall be conducted with a series of techniques to identify the mechanisms underlying this species' ability to colonise, spread and persist across such a wide range of conditions.

Does dimethyl sulphide (DMS) protect dinoflagellate symbionts (*Symbiodinium* sp.) and their hosts from oxidative stress?

Michael Steinke, Patrick Brading, Philip Kerrison, Daniel R. Pratt, Craig W. Reed, Mark E. Warner, David J. Suggett

Dimethylsulphide (DMS) and dimethylsulphoniopropionate (DMSP) are sulphur compounds that may function as antioxidants in algae. Symbiotic dinoflagellates of the genus *Symbiodinium* show strain-specific differences in their susceptibility to temperature-induced oxidative stress and have been shown to contain high concentrations of DMSP. We investigated continuous cultures of four strains from distinct phylotypes (A1, A1.1, A2 and B1) that can be characterised by differential thermal tolerances and quantified the production of hydrogen peroxide (H₂O₂) and DMS in the model symbiotic sea anemone *Aiptasia* sp. We hypothesised that strains with high thermal tolerance have higher concentrations of DMSP and DMS in comparison to strains with low thermal tolerance, and that light (PAR and UV) and temperature stress increases the production of H₂O₂ and DMS in symbiotic cnidarians. DMSP concentrations were strain-specific with highest concentrations found in A1 (225±3.5 mmol L⁻¹ cell volume) and lowest in A2 (158±3.8 mmol L⁻¹ cell volume). Both strains have high thermal tolerance. Strains with low thermal tolerance (A1.1 and B1) showed DMSP concentrations in between these extremes (194±19.0 and 160±6.1 mmol L⁻¹ cell volume, respectively). DMS data did further confirm this general pattern with high DMS concentrations in A1 and A1.1 (4.1±1.22 and 2.1±0.37 mmol L⁻¹ cell volume, respectively) and low DMS concentrations in A2 and B1 (0.3±0.06 and 0.5±0.22 mmol L⁻¹ cell volume, respectively). Hence, the strain-specific differences in DMSP and DMS concentrations

did not explain the different abilities of the four phylotypes to withstand thermal stress. The production of H₂O₂ and DMS showed a positive correlation with the level of environmental stress. Future work should utilise the differential patterns of DMS production in selected *Symbiodinium* strains to create specific host-symbiont couplings and identify the effect of phylotypes on DMS production and stress physiology in cnidarians.

Student Representative



Helen Rosenkranz
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I would like to introduce myself as the new student representative of the British Phycological Society (BPS) council. On the BPS winter meeting in Cardiff at the beginning of this year I took over from Agnes Mols Mortensen. She and the student reps before her, brought students interests into the Council resulting in a strong interest of the BPS in us students. Following on from her, my job is to represent student members and keep bringing their thoughts and ideas into the committee. Meeting some of the other students during the BPS Winter meeting was great, especially as I could see that many enthusiastic students are part of the society.

Some words about me: Being always interested in water related sciences, I found my great interest in microalgae during my five years of studying Biology in Göttingen (Germany), resulting in my Diplom thesis (equivalent M.Sc.) at the Algae Collection (EPSAG) in Göttingen, focusing on aero-terrestrial

algal biofilms growing in a bunker on Helgoland island. Currently I am undertaking my PhD at the University of Bristol (UK) studying biofilms, but this time biofilms in freshwater and the impact of herbicides on these communities.

During my undergraduate years I was involved in work as a student rep and really enjoyed that work, as in my opinion bringing in fresh ideas from the student communities is enriching debates in a positive way. As students are the next generation of phycologists, I believe that being a member of the British Phycological Society is a good opportunity to get to know each other and the science we undertake, which is a great opportunity that can even result in new collaborations. There were so many inspiring ideas out there during the BPS meeting in Cardiff January 2011, so I am looking forward to productive interactions. You are welcome to e-mail me your questions, comments, suggestions.



Manton Prize Winner

Sebastian Hess. Protistan parasites of freshwater algae.



Because of my intimate contact to nature in my childhood I became interested very early in freshwater life. One of the most important memories is my intensive search for Hydra in the ponds of my hometown when I was ten years old. I saw drawings of it in a book and was fascinated by an organism which was neither a plant nor a "real" animal. For a child in this age it was just mysterious. I built dip nets using coat-hangers and my mum's nylon stockings, and equipped with empty jam jars I explored the fauna of ponds and streams. When I saw unicellular organisms like *Vorticella* I realized the microscopic dimension for the first time. During teenage years my interests expanded. I built up a large collection of minerals with a special focus on the radioactive ones (when fourteen I got my first Geiger-Mueller counter). My room was equipped with several fish tanks and about 100 different species of carnivorous plants, especially of the genera *Drosera* and *Utricularia*. In general I was fascinated by the biotic interactions and the mechanisms of nutrition. When I was seventeen I got in touch with the bryologist Prof. Jan-Peter Frahm of the University of Bonn. He gave me the opportunity to investigate *Pleurozia purpurea*, a liverwort which was thought to be carnivorous. For feeding experiments I used the amazing pink ciliate *Blepharisma*. That was like a reunion with the protistan world and I had a lot of fun to cultivate ciliates and isolate them from natural samples. After I won the German Youth Research Competition "Jugend forscht" in 2005 with the first experimental evidence of carnivory in *Pleurozia purpurea*, I started my studies in biology at the University of Bonn.

Since then I focused on protists and being an enthusiastic microscopist I joined the freshwater algal excursion by Prof. Michael Melkonian of the University of Cologne. Following his kind offer I worked in his lab whenever I had some free time beside the course of my studies. Observing freshwater samples in 2008 I came across green moving cells within the filaments of the zygnetophyte green alga *Mougeotia*. Because of their flagella these strange cells could not belong to the alga and they turned out to be parasites. Trying to identify the organism I realized the huge diversity of poorly known protists, which live on freshwater algae in a parasitic manner. Since the 19th century scientists have described these protists and discussed their position in the system of life. Nowadays we don't know much about them, because they are difficult to cultivate, and many species have never been found again since their original description. Furthermore, some descriptions are doubtful, because the criteria for species definition used in the past differed from those we use today. So it was a challenge for me to look for such creatures in nature and to establish stable cultures, and in the meantime I built up a collection of about twenty strains, containing different amoeboid flagellates and members of the famous vampire amoebae. Combining modern techniques of culturing, microscopy and molecular phylogenetics it was possible to gain a deep knowledge about the investigated strains.

Within my diploma thesis supervised by Prof. Melkonian three isolates with cercozoan affiliation (termed PC-strains), an unknown flagellate organism (UFO) with its very peculiar swimming behavior and an isolate of the old and doubtful genus *Pseudospora* have been studied with regard to morphology, infection cycles and their phylogenetic position using the nuclear-encoded SSU rDNA. Especially the time lapse microscopy gave exciting insights into the infection cycles and the very slow amoeboid cell locomotion, whereas the molecular phylogenies showed the scattered positions of several parasite strains in the tree of life.

It was a pleasure for me to present some results of my work at the BPS winter meeting in Cardiff and I enjoyed the warm and inspiring atmosphere. Finally I want to thank the British Phycological Society for awarding the Irène Manton Prize to me and for the financial support.

Poster Prize Winner

Jan Grueneberg. Bacterial induction of algal morphogenesis in *Ulva mutabilis* in the lagoon Ria Formosa (Portugal): A bioassay guided approach.



I am living in Jena (Thuringia) about 400 km away from the coastline in Germany, but studying the interaction of marine macroalgae and its associated bacteria at the Institute for Inorganic and Analytical Chemistry (Friedrich Schiller University Jena). How does this fit together?

When I started to study chemistry it was a decision based on curiosity in investigating nature represented by different natural sciences. In school I never understood why we had to separate between chemistry, biology, physics and geology so strictly, as we have often performed similar experiments in different lessons. For instance, the molecules of life such as sugars certainly belong to the 'chemical world' and to the 'biological world'. The decision to study chemistry was motivated by my teacher's great skills to let it look like the most interesting part of science, giving most answers about the molecular world of nature.

As an undergraduate at the Friedrich Schiller University I always favoured those lab courses which included analytical tasks.

Recognising early that improving the specific features of certain materials and molecules would never fulfil me with pleasure, I was excited by a lecture about chemical ecology given by Georg Pohnert in my third year at university. He combined subjects, which my teachers had always tried to separate: the chemistry of molecules and their function in the biological world. During a fascinating internship at the Max-Planck-Institute for Chemical Ecology in Jena, I was convinced that I found the field, which I like to work in. After my diploma thesis on the wound reaction of the terrestrial ferns, I actually thought of changing to a new town for my PhD. I obtained a scholarship to investigate my new topic in the group of Thomas Wichard: "The interaction of *Ulva mutabilis* and its associated bacteria". I am happy to work in the field of my passion about studying the beauty of molecules and their role in the interaction of organisms.

In Jena we often work with very controlled cultures of *Ulva* spp. under standardised conditions. Being far from the sea, the natural habitat of my alga, I have to prove, that my lab-results are ecologically relevant in the natural habitat of *Ulva*. Therefore we took the chance and received a grant from ASSEMBLE (Association of European Marine Biological Laboratories) to perform field experiments at the CCMAR in Faro (Portugal), the place where our algae had been collected by Føyn about 60 years ago. In between running my experiments in Faro, it was a pleasure to see 'my algae' in the lagoon and on the rocks nearby and to watch it fighting against waves and sun, while I was standing there in rubber boots. This experience was made possible only due my algal research and is something a 'typical' chemist will never discover during lab work. I am thankful towards the JSMC and ASSEMBLE to make this kind of research possible.

Winning the poster award of the BPS is a great honour to me.

The 14th International Conference on the Cell and Molecular Biology of *Chlamydomonas*

Joanna Szaub
PhD Student in Microbiology
Research Department of Structural
and Molecular Biology
University College London
j.szaub@ucl.ac.uk



The 14th International Conference on the Cell and Molecular Biology of *Chlamydomonas* was held this year in Norton, MA, USA from 6-10 June. It is a biennial conference that brings together scientists from different disciplines such as genetics, genomics, biotechnology, cell biology, ecology, biophysics and plant physiology to discuss their work approach on a single-cellular alga *Chlamydomonas reinhardtii*. *C. reinhardtii* is a key model organism that has been widely used in research on photosynthesis, respiration, cell differentiation, flagellar motility, evolution, biotechnology and many others.

The main topics of the conference included: Adaptation and stress responses, Circadian rhythms and cell

cycle, Flagellar structure and function, Biotechnology, IFT and flagellar assembly, Evolution, Development and Life Cycle, Photosynthesis, Light Perception and Photoresponses, Chloroplast Function and Biogenesis, however these three topics - Gene Regulation, Genetics and tools, and Biofuels and Metabolism I found particularly relevant to my research.

This conference gave me a great opportunity to present my data I obtained during the first two years of my PhD and allowed me to interact with leading algal scientists, and I am deeply grateful to the British Phycological Society for financial support that enabled me to attend this fantastic conference.



2010 Hilda Canter-Lund Photography Award Winner

The apical tip of the giant kelp *Macrocystis pyrifera*, the largest seaweed on earth reaching up to 40-50 metres long, taken by Dr Erasmo Macaya is the winner of the 2010 Hilda Canter-Lund Photography Award. The image was taken in Scorching Bay, Wellington, New Zealand.

Dr. Erasmo Macaya is a Chilean phycologist, he received a primary degree in Marine Biology and a Masters in Marine Sciences from Universidad Católica del Norte, Coquimbo, Chile. During this time he carried out research on two different aspects of phycology such as, spore aquaculture in a red alga and inducible defences in macroalgae, and published the first report of inducible defences in a macroalgae from the South-Eastern Pacific. In 2006, Erasmo moved to New Zealand to carry out his PhD at Victoria University of Wellington, to study the dispersal patterns, connectivity, taxonomy and genetic diversity of the giant kelp, *Macrocystis pyrifera*. Since 2010, he is Assistant Professor at Concepción University, Chile. He is also Director of the Chilean Phycological Society. Erasmo has received some recognition during his short career, such as the award for the best oral presentation at the XXVIII International Seaweed Symposium in Norway in 2004, for his article 'Presence of sporophylls in floating kelp rafts of *Macrocystis* spp. along the Chilean Pacific Coast' which represents the first truly study that demonstrate that kelp floating rafts remain

reproductive while drifting. Also, the Benthic Science Student Prize for thinking outside the square: Creativity in Science at the New Zealand Marine Sciences Conference, Auckland, New Zealand, in 2009, for his presentation: 'Moving around the oceans: Global phylogeography and taxonomy of the giant kelp *Macrocystis*'

He is a young phycologist carrying out research in different areas such as: inducible defences of macroalgae, importance of floating algae on dispersal patterns, DNA barcoding and Phylogeography among others. But also he is having a lot of fun photographing the marine flora of New Zealand and Chile.

More information at www.algalecology.com

Other short listed images are also shown.

Coleochaete scutata, Christopher F. Carter.

Micrasterias radiata prox, Chris Reiken.

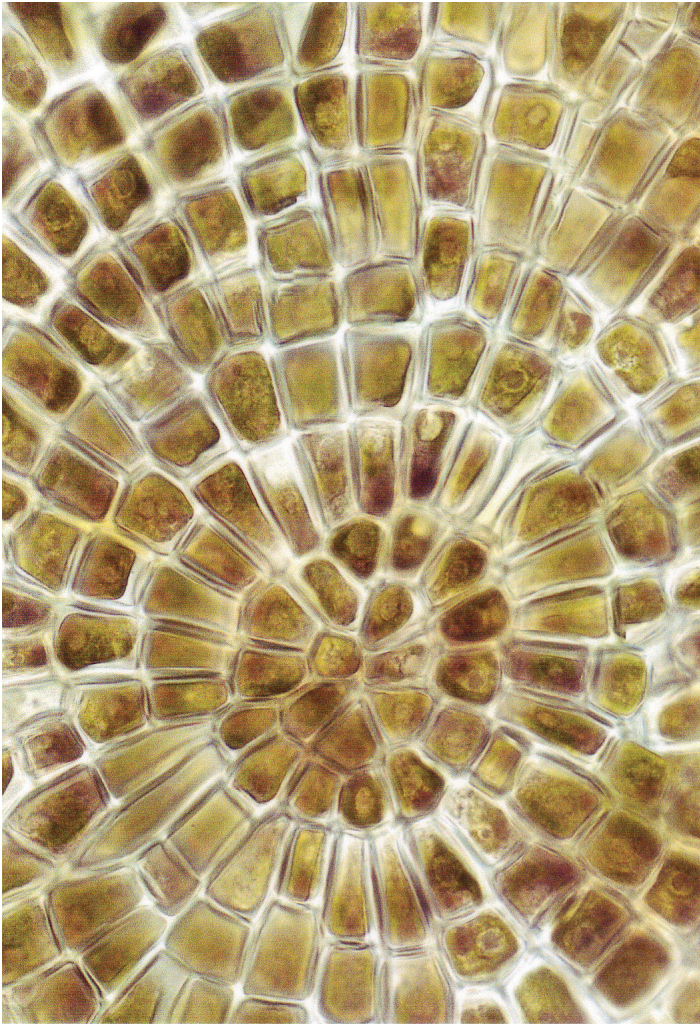
Chaetoceros chaos, Eileen Bresnan.

Hidden Universe - Langdale Tarn algae, Gordon Beakes.

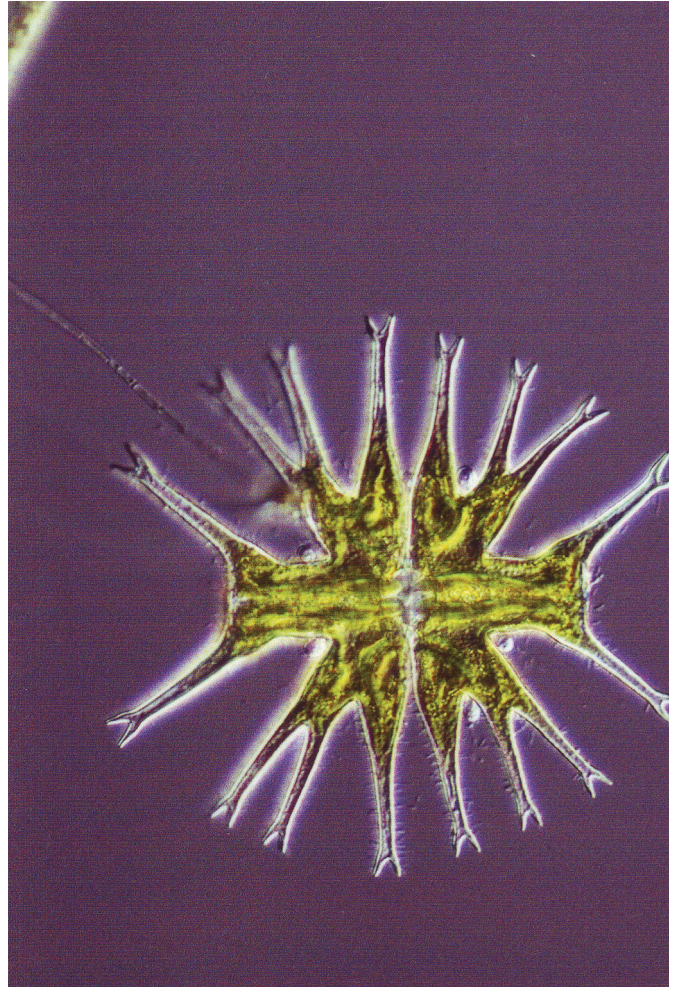
Phycological Art or Artefact?, Dr Hans Sluiman



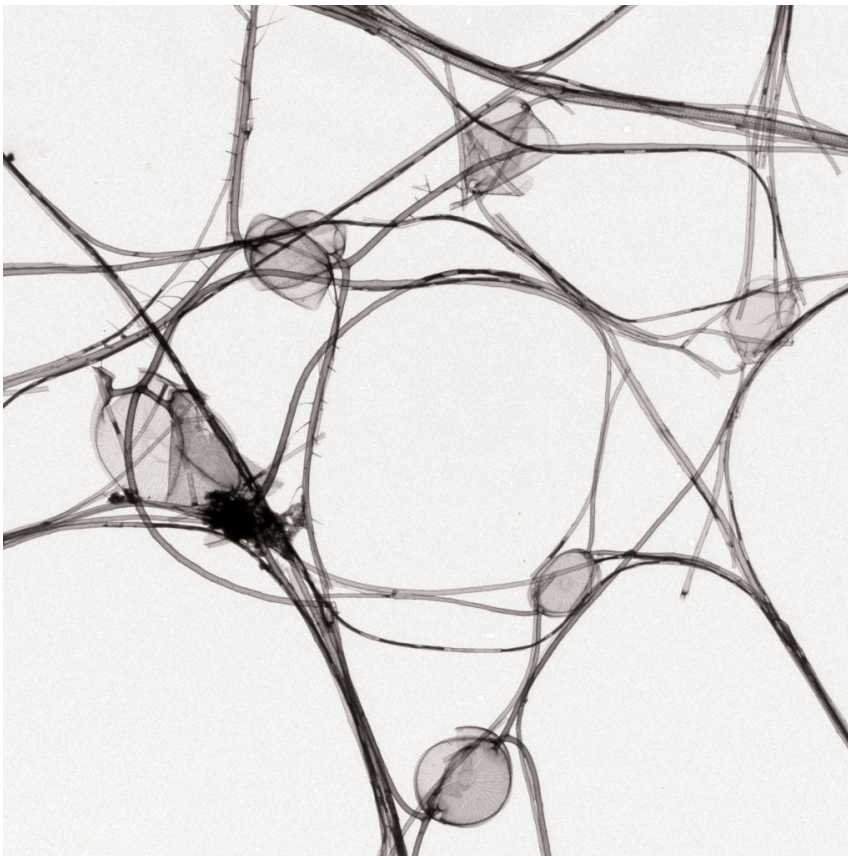
Apical tip of the giant kelp *Macrocystis pyrifera*. Erasmo Macaya



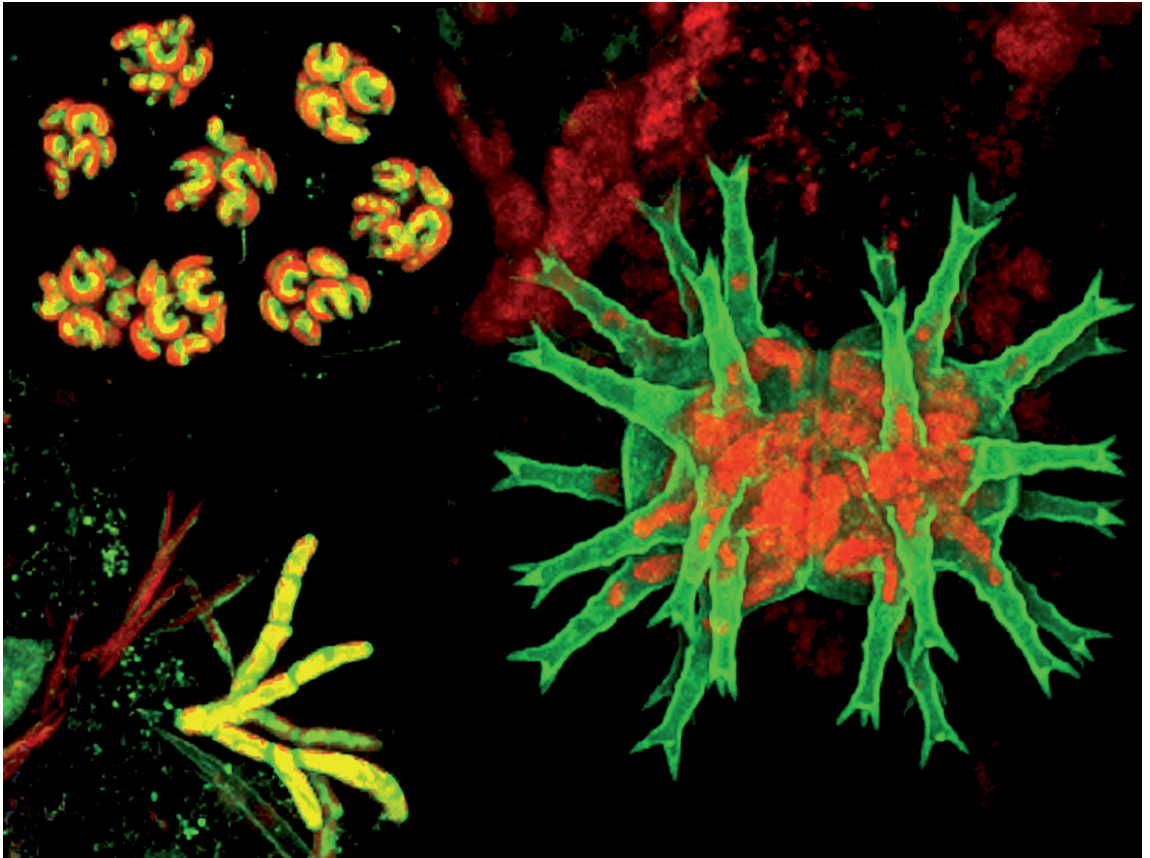
Coleochaete scutata, Christopher F. Carter.



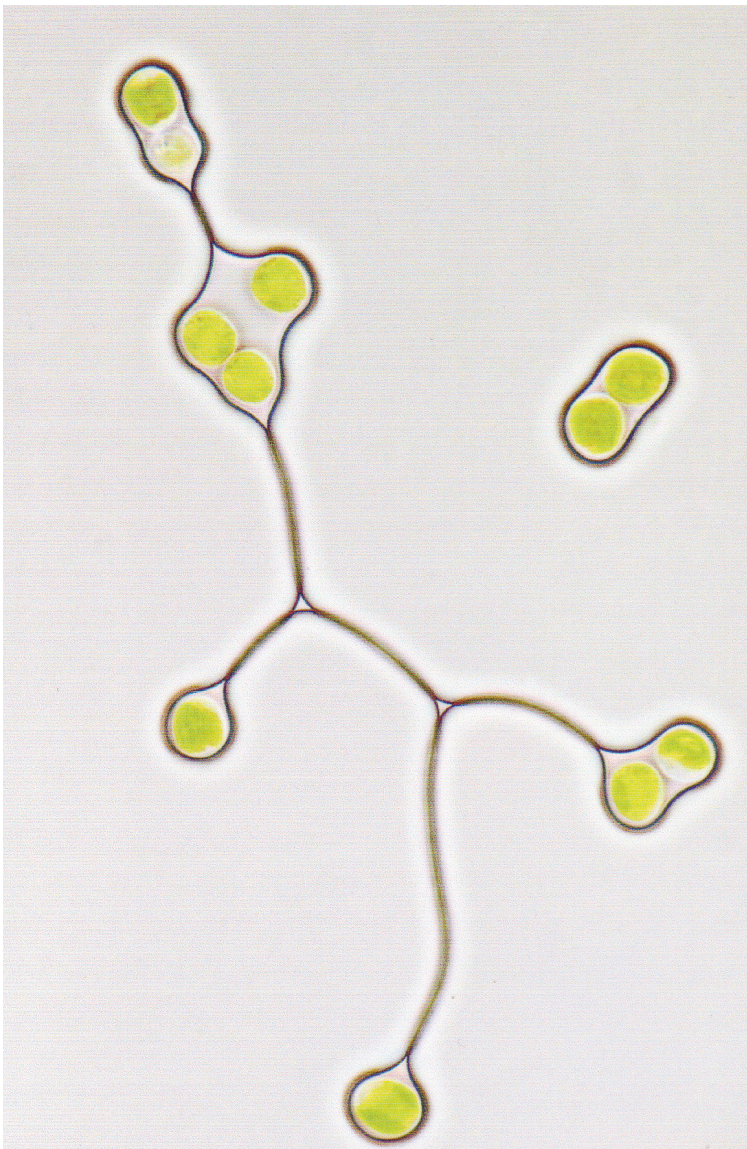
Micrasterias radiata prox, Chris Reiken.



Chaetoceros chaos, Eileen Bresnan.



Hidden Universe - Langdale Tarn algae, Gordon Beakes.



Phycological Art or Artefact?, Dr Hans Sluiman.

Minutes of the British Psychological Society

59th Annual General Meeting

Cardiff, Friday 7th January 2011

Present: Shazia Aslam, John Bothwell, Paul Brazier, Eileen Bresnan, Juliet Brodie, Jennifer Bryant, Francis Bunker, Chris Carter, Ana Castro, Julian Clokie, Martha Clokie, Geoffrey Codd, Eileen Cox, Richard Crawford, Ruth Crundwell, Richard Dorrell, Maeve Edwards, Emmanuelle Evariste, Michelle Fernandes, Stewart Finch, Naomi Ginnever, Emma Goodyer, Jan Grüneberg, Paul Hayes, David John, Stefan Kolle, Louise Kregting, Jan Krokowski, Barry Leadbeater, Emma Leedham, Jane Lewis, Deirdre McLachlan, Gill Malin, Sara Marsham, Linda Medlin, Agnes Mols Mortensen, Monica Moniz, Klaire Neale, Zofia Nehr, Katy Owen, Marie Pazoutová, Rupert Perkins, Jane Pottas, David Pritchard, Diane Purcell, John Raven, Fabio Rindi, Helen Rosenkranz, Clare Scanlan, Elliot Shubert, Michael Steinke, Graham Underwood, Heroen Verbruggen, Frederic Verret, Jo Wilbraham, Martin Wilkinson, Chris Williamson, Ria Woodfield, Marian Yallop.

1. Apologies

Patrizia Albertano, John Day, Michael Guiry, Martyn Kelly, Chris Maggs, David Mann, James Metcalf, Michelle Tobin.

2. Minutes of Winter Council meetings and 58th AGM, January 2010

Accepted.

3. Matters arising

None

4. Reports from Officers

a) Secretary (Jane Pottas)

Normal secretarial duties have been carried out this year. Emails requesting specific help or information have been responded to with the help of members of Council. An unusual request from a Channel 4 television researcher in London for a supply of seaweed for a television chef was fulfilled. I would like to thank Juliet for her support and guidance during her presidency. Juliet thanked Jane for her work.

b) Treasurer (Michelle Tobin)

SM commented on the report in the absence of the Treasurer. Income in 2009-2010 was slightly less than expenditure although direct comparison with the previous year is difficult due to a double payment of the EJP profit share in 2009. Very low interest rates have had a significant effect on income and this is unlikely to change in the current economic climate. Unrestricted reserves are approximately £108K. Income is heavily reliant on the profit share from EJP since interest rates are very low. The BPS is guaranteed £30k for the duration of the contract with Taylor & Francis which to date has generated in excess of this. A payment of £10k is now being made annually to the EJP Editor and the journal costs about £7k to produce. Income from membership is not increasing. Although numbers are up in some years many of these are students who draw on funds through studentships etc. Michelle's term of office is drawing to a close. She asked Council to consider seeking a new Treasurer and suggested that whoever is appointed should have a lead in time

before taking over the office. Juliet thanked Michelle for her work.

c) Membership Secretary (Sara Marsham)

The on-line database continues to work well with few problems being encountered by the membership. The current active membership of the Society is approximately 500 ((377 fully paid up, 93 paid to end of 2009, and 11 Honorary Life Members) which represents an increase on numbers in 2009. Renewal rates have been maintained and the recruitment rate has improved. Council is discussing how to increase retention because students frequently let their membership lapse on completion of their PhD. Of the 377 fully paid up members, 219 receive the EJP including 28 of the student members. Problems persist with EJP's informaworld platform but subscribers to the on-line journal will receive log in and password details. The BPS PayPal account is now active and all members paying electronically are urged to use this system, the benefits being that payment is instant and completely secure and guaranteed by PayPal. Members do not need to have a PayPal account to pay by this method. SM noted with regret that the Society lost two members this year: one of the Honorary Life Members, Prof. Frank Round and Dr Yvette Berger. Council proposed to make two new Honorary Members in recognition of their work for the society - Harry Powell, as first secretary of the Society when it was founded in 1952, and Professor Michael Guiry, for his lifelong work in psychology and his continued and much valued support of the Society. These nominations were approved by the membership. Sara thanked Michelle Tobin for her help with processing payments, Michael Guiry, Pier Kuipers and Caoilte Guiry for maintaining the database and advice regarding PayPal and also Council for their continued support. Juliet thanked Sara for her work.

d) Student representative (Agnes Mols Mortensen)

Agnes had tried to involve the student members attending the winter meeting by suggesting that a student lecture be included in the programme. She outlined the difficulties she had encountered when trying to arrange the student lecture at the Winter Meeting and recommended that all practical details be in place when the student representative contacts potential speakers so that they will have a better idea of the nature of the invitation. She thanked Rupert Perkins for arranging a student lecture on scientific writing by Taylor & Francis. She had contacted the student members through e-mail to ask them for suggestions with regard to the BPS webpage, to remind them about funding opportunities from the Society and to ask for ideas and suggestions to bring to Council. She urged students to take a more active part in the Society and encouraged them to respond to emails from her successor, Helen Rosenkranz. Agnes expressed thanks for having had the opportunity to represent the student members on Council. Juliet thanked Agnes for her work and for being an active student representative.

e) Editor of the European Journal of Psychology (Christine Maggs)

JB commented on the report in the absence of CAM. She thanked Eileen Cox and John Day, the previous joint Editors-in-



Chief, and Chris as interim Editor for all her work in the previous year as she hands over to David Mann who will take over as Editor assisted, at least initially, by the Editorial Assistant, Erica Young. Two Assistant Editors have been appointed: John Bothwell (molecular, genomics) and Anne Jungblut (cyanobacteria). Further Associate Editors will be sought as required to review the increasing proportion of molecular biology submissions. The quality of many applied phycology manuscripts and their suitability for *EJP* continues to be a cause of concern and a matter for future discussion. An international editorial meeting is planned to take place at IPC Rhodes in 2011. There were some serious delays with the issues of Vol. 45 of the *European Journal of Phycology* although papers were generally available online as iFirst. These problems should be resolved under CUP and the new editorial team. The main reason for the drop in the *EJP* impact factor (1.556 in 2009, cf. 1.826 in 2008) is likely to be the denominator. This may improve once the backlog of papers is cleared.

f) Editor of The Phycologist (Jan Krokowski)

The 2010 spring issue was ready for dispatch by mid-April but travel disruption from the volcanic ash cloud from Eyjafjallajökull delayed receipt to several members. The autumn edition was dispatched by early October with no delays or disruptions. Both issues received positive comments and feedback from members. There continue to be a small number of returns and members are again advised to check and amend their address details. Total 2010 costs were £4009.18. Layout and typesetting continue to be provided by Ms Agnès Marhadour and printing by Monument Press in Stirling, Scotland. Jan thanked SEPA's Admin staff in East Kilbride, Donna Farren, Kirsten Knight and Yvonne McGowan (managed by Allison Currie) for all of their help with the newsletters. Council approved the printing of two additional pages in colour which would add £76 to the overall cost. In future book reviews will be published in *The Phycologist* and also posted on the BPS website, and past reviews will be made available on the website. Jan thanked everyone for their contributions to *The Phycologist* and reminded members that all relevant material will be considered (job adverts, science reports, book reviews, news items of topical interest, meeting announcements, research news) as well as suggestions for future articles. The winners of the Manton Prize and the Poster Prize will be asked to write articles for *The Phycologist*. Deadlines for submissions are March 1st for the spring edition and September 1st for the autumn edition. Juliet thanked Jan for all his work.

g) Webmaster (Michael Guiry)

JB received comment on the website in the absence of Michael Guiry. She thanked Michael for all his work on the website and also Pier Kuipers and Caoilte Guiry.

h) Student Awards and Training Committee (Geoffrey Codd)

Following review in June 2010 a summary of judging criteria and advice for entrants was drawn up and posted on the BPS website. The three month requirement for membership of the BPS applies to all postgraduate student applications (other than for support to attend BPS Annual Meetings) but despite clear statements in website Guidelines ineligibility because of membership issues persist. Effective monitoring of these requirements has been established with the Membership Secretary. The maximum size of awards (which are partial awards) of £5000 per project has been retained. Evidence of partial funding of project costs from elsewhere is not an essential

requirement. Applications in 2010 were received from Canada, the Czech Republic, Germany, Greece, India, Ireland, Spain, the UK and the USA and to 22nd December the total sum of £15650 was awarded for 22 student bursaries, 2 Summer Undergraduate Projects and 4 Project Awards with 1 Student Bursary, 1 Summer Undergraduate Project and 3 Project Award applications pending. The titles of all Project Awards made and names of investigators are to be listed on the BPS website and recipients of awards are required to submit an article to *The Phycologist*. The definition and administration of the President's Award Scheme and selection of recipient(s) is to be a matter for the BPS President in consultation with the Student Awards and Training Committee. The organisers of all future field courses, workshops and summer schools, which they wish to be considered for BPS funding (via Student Bursaries) are required to send documented information on the course structure to the Chair of the Awards and Training Committee. Geoff thanked Gill Malin, Rupert Perkins and Michelle Tobin for their contributions to the A&TC, and Michael Guiry and Sara Marsham for help with website and membership requirements. Juliet thanked Geoff and the committee for their work.

i) Biodiversity and Conservation Committee (Martin Wilkinson)

The remit of the committee will include recording schemes, public outreach, guidance and co-ordination of the many mass observation schemes, a brown seaweed identification course, and the development of electronic identification guides. MW is to write an article for *The Phycologist* outlining the work of the committee and he appealed for members to respond with suggestions and feedback for the committee. The Seasearch Guide to Seaweeds of Britain and Ireland has now been published with financial support from the BPS. Martin reported that the published work is excellent and he complimented Francis Bunker on the guide and also thanked David John for his work on the second edition of the freshwater algal guide. Juliet thanked Martin and the committee for their work.

j) Education and Outreach Committee (Marian Yallop)

This committee has been revived after several years. Its remit is to increase recruitment and retention of membership of the BPS. It plans to promote teaching about algae at all levels; to seek funding to promote teaching about algae in schools; to extend the photography competition into schools; to increase the profile of phycology in the media. Marian urged members to contact her with ideas for the committee.

All reports were accepted: Proposed by Elliot Shubert, seconded by Eileen Cox.

5. Federation Reports

a) Federation of European Phycological Societies (FEPS) (Geoffrey Codd)

FEPS membership has increased to 11 national member societies representing 13 European countries. The membership currently consists of: British Phycological Society, Belgian-Dutch Phycological Society, Phycological Branch of the Croatian Botanical Society, Czech Phycological Society, French Phycological Society, Phycology Section of the German Botanical Society, Hellenic Phycological Society, Hungarian Phycological Society, Algology Working Group of the Italian Botanical Society, Polish Phycological Society and the Spanish Phycological Society representing a total membership of 1118 (2010). FEPS' aims include the construction of a list of experts in phycological matters, to be available on the FEPS website. The

Fifth European Phycological Congress (EPC5) will be held in Rhodos, September 4-9, 2011, the first major conference under the auspices of FEPS. Sponsorship is being sought from Greek companies and the Greek Government and all national member societies will be requested to support EPC5 by various mechanisms such as support of Plenary Lectures and funding of students to attend EPC5. Prof. Michael Guiry, National University of Ireland, has been appointed as FEPS webmaster (<http://www.feps-algae.eu/cms/>). Discussions are in progress with 2 prospective publishers regarding publication of the FEPS journal *Perspectives in Phycology*. Prof. Marina Aboal, University of Murcia, President of the Spanish Phycological Society has been elected as President; Prof. Burkhard Becher, University of Cologne, Germany is Vice-President; Dr. Francisco Arenas, CIMAR, Porto, Portugal is Secretary and Prof. Elliot Shubert, NHM, London is Treasurer. Geoff will continue to represent the BPS at FEPS meetings. Juliet thanked Geoff for his work.

b) Federation of European Microbiological Societies (FEMS) (Paul Hayes)

The BPS is a full member of FEMS and BPS members are eligible to apply for research fellowships, visiting scientist grants, young scientist meeting grants and/or support when organizing a meeting. The attention of members was drawn to an article by Geoffrey Codd in *The Phycologist*, FEMS: Funding and Other Opportunities for BPS Members (Number 79 Autumn 2010).

c) Society of Biology (SB) (Paul Hayes)

The Society of Biology is a lobbying organisation in the UK and is the united voice of Biology, previously a very fragmented community. The BPS is a full member and as such is entitled to all Society benefits, and is eligible to vote. <http://www.societyofbiology.org/home>

6. Future Meetings

- a) Newcastle 4th - 6th January 2012, local organiser: Sara Marsham. Call for suggestions for special sessions.
- b) BPS 60th Anniversary - A one day extra special summer meeting is planned for June 2011 with the aim of moving the

annual meeting to summer as of 2012.

c) EPC5 - The Fifth European Phycological Congress (EPC5) to be held in Rhodos, September 4-9, 2011. (<http://www.epcv.gr/>). There are to be plenary presentations, special symposia, contributed papers and posters, that will highlight algal research conducted in Europe. Elliot Shubert, as Chair of the Scientific Committee, invited all BPS members to attend. Juliet thanked Elliot.

7. Membership

Changes to Council Officers as of January 2011 are as follows: President - Paul Hayes; President Elect - Christine Maggs; Immediate Past President - Juliet Brodie; Overseas Vice President - Professor Siew Moi Phang of the University of Malaya. Agnes Mols Mortensen retires as Student Representative to be replaced by Helen Rosenkranz. The term of office of Rupert Perkins, Martin Wilkinson and Martyn Kelly (Ordinary Members of Council) has ended. Juliet thanked them for their work. Nominations received for Ordinary Council membership were Dr. Maeve Edwards, National University of Ireland, Galway; Dr John Bothwell, Queen's University, Belfast; and Prof Elliot Shubert, NHM, London. All nominations were proposed by Graham Underwood and seconded by John Raven.

8. Any other business

Juliet thanked Rupert Perkins for his work in organising the Winter meeting in Cardiff. Rupert expressed his thanks to Juliet Brodie, Jane Pottas, Michael Guiry, Sara Marsham and Michelle Tobin. He also particularly thanked the students who had assisted with preparations and registration at the meeting.

Juliet made closing remarks to mark the end of her period of office as President. She thanked Council for their support. Paul Hayes proposed a vote of thanks to Juliet for being an active and excellent president. All concurred.

The meeting ended at 6.19pm.



BPS Council 2010.



Annual Report for the year ended 30 September 2010

The British Psychological Society Registered Charity No. 246707

The Society is an unincorporated association governed by its constitution and administered by its Council (trustees). The addresses of the current office bearers are set out in the *European Journal of Psychology*.

Membership of the Council of the Society:

Executive Members

President:	Professor J. Brodie	Treasurer:	Dr M.L. Tobin
Vice President:	Dr P. Hayes	Eds (<i>Eur. J. Psych.</i>):	Professor C. Maggs
Overseas Vice President:	Professor P. Albertano		
Immediate Past President:	Professor G. Codd	Ed. (<i>The Psychologist</i>):	Dr J. Krokowski
Secretary:	Dr J.Pottas	Webmaster:	Professor M.D. Guiry
Membership Sec:	Dr S. Marsham		

Ordinary Members

Dr L. Medlin	Dr D. Mann	Dr J. Metcalfe	Dr R. Perkins
Professor C. Maggs	Dr M. Kelly	Dr E. Bresnan	Professor M. Wilkinson
Dr M. Yallop	Ms A. Mols Mortensen		

Principal bankers:	Bank of Scotland, 39 Albyn Place, Aberdeen
Solicitors:	Wolferstans, 60/64 North Hill, Plymouth
Independent Examiner:	Flannigan, Edmonds and Bannon, 2 Donegal Square East, Belfast

This is the seventh Annual Report presented by the current Treasurer. It is made in this form to meet the requirements of the Statements of Recommended Practice (SORP), issued by the Charity Commission and serves as an annual record of the resources entrusted to the Society and the activities it has undertaken.

The Society has continued to give financial support to activities that promote psychological research, disseminate psychological knowledge and assist young psychologists to present their findings at scientific meetings. The 2010 annual winter meeting and AGM were hosted by the Scottish Association for Marine Sciences in Oban, Scotland and thanks go to Dr John Day and his team for organising a successful meeting despite the adverse weather. The meeting offered a wide range of presentations of a high standard. Congratulations go to Karen Mooney and Franciska Steinhoff whose excellent presentations meant they shared the 2009 Manton Prize, and also to Krishna Sharma for winning the Poster Prize. Nine students received support to attend this meeting from the Scientific Meetings Fund (SMF) (twelve in 2009). The auction, quiz and sales raised £143, with thanks going to Elliot Shubert for his hard work. The meeting returned no surplus and the monies from the 2009 meeting will be carried over to support the 2011 meeting in Newcastle.

The Society supported ten students to attend identification courses, workshops and conferences. One summer studentship was awarded in 2010 (two in 2009). Three project grants were awarded during this year. The Hilda Canter Lund award for photography was presented to Mariano Sironi. The Society continued to receive an encouraging number of applications for funding in this financial year and was able to support a good number of student members to develop and present their psychological knowledge both in the UK and abroad.

During 2010 honoraria were awarded to the following council members: the Membership Secretary, Secretary and the Editor of *The Psychologist* each received £750, the Treasurer received £1000. This year the Society introduced a new stipend to support the increasing work of the Editor of the society's Journal. To this end an honorarium of £10,000 was awarded to the Editor in Chief of EJP. In addition Taylor and Francis provided £2,528.37 to support the work of the editorial assistant.

The *Journal* performed very well financially and the final profit share from Volume 44 was £42,094.23 comprising the advance of £30,000 in 2009 and an additional £12,094.23 this year (£31,173.03 for Volume 43).. In addition the Society has received an advance of £30,000 guaranteed income for Volume 45. Production costs of the Journal remain low at £6,615.00 for Volume 44 (£6,588.00 for Volume 43).

The Society's financial situation remains good and this has allowed the support of a wider range of projects and awards. The Scientific Meetings Fund was topped up to a total of £25000 to allow the Society to support students with bursaries from the interest it receives.

Finally, I would like to thank all Council and Society members for their co-operation and support during this financial year.

The British Psychological Society

Registered Charity No. 246707

Statement of Financial Activities for the Year ended 30th September 2010

	Note	Unrestricted General £	Designated S.M.F. £	Restricted Manton £	Total 2010 £	Total 2009 £
Income and Expenditure						
Incoming Resources						
Subscriptions 2008		0.00	0.00	0.00	0.00	616.50
Subscriptions 2009		723.00	0.00	0.00	723.00	5,305.00
Subscriptions 2010		4,212.00	0.00	0.00	4,212.00	0.00
Journal profit share 2008		0.00	0.00	0.00	0.00	31,173.03
Journal profit share 2009		12,094.23	0.00	0.00	12,094.23	30,000.00
Journal profit share 2010		30,000.00	0.00	0.00	30,000.00	0.00
Auction/quizz/sales proceeds		0.00	143.00	0.00	143.00	209.00
FW Atlas		472.62	0.00	0.00	472.62	232.75
Interest		(1,305.94)	0.00	0.00	(1,305.94)	7,390.04
Winter Meeting 2009		0.00	0.00	0.00	0.00	5,700.00
Winter Meeting 2009 cc registrations		0.00	0.00	0.00	0.00	5,180.00
EJPMC		2,528.37	0.00	0.00	2,528.37	2,491.00
Total Incoming Resources		48,724.28	143.00	0.00	48,867.28	88,297.32

Resources Expended						
Grants, studentships & awards	2	10,299.11	2,870.38	250.00	13,419.49	12,836.63
Publications expenditure	3	21,056.05	0.00	0.00	21,056.05	14,707.67
Meetings & Committee Expenses	4	9,548.83	0.00	0.00	9,548.83	17,932.98
Administration Costs	5	8,519.91	0.00	0.00	8,519.91	11,294.58
		49,423.90	2,870.38	250.00	52,544.28	56,771.86
Net Incoming (Outgoing) Resources for the Year		(699.62)	(2,727.38)	(250.00)	(3,677.00)	31,525.46
Fund at 1 October 2009		110,948.37	25,000.00	4,444.09	140,392.46	108,867.00
Transfer (General to SMF)		(2,727.38)	2,727.38	0.00	0.00	0.00
Fund at 30 September 2009		107,521.37	25,000.00	4,194.09	136,715.46	140,392.46

Balance Sheet as at 30 September 2010

		2010 £	2009 £
Current Assets			
Debtors	7	3,905.29	7,700.00
Short term deposits		144,609.29	136,344.71
Cash at bank		3,086.83	10,038.75
		151,601.41	154,083.46
Liabilities: amounts falling due within one year	8	14,885.95	13,691.00
Net Assets		136,715.46	140,392.46
Funds			
Unrestricted	9	107,521.37	110,948.37
Restricted		4,194.09	4,444.09
Designated		25,000.00	25,000.00
		136,715.46	140,392.46

Signed on behalf of the British Psychological Society
Dr Michelle Tobin
Treasurer



The British Psychological Society

Notes to the Account for the Year ended 30 September 2010

1 Accounting Policies

The accounts have been prepared in accordance with applicable Accounting Standards and the SORP - Accounting and Reporting by Charities issued in March 2005. A summary of the more important policies, which have been applied consistently, is set out below:

Basis of Accounting

The Accounts are prepared in accordance with the historic cost basis of accounting.

Subscriptions

Subscriptions include amounts received from members during the year. No amount is included in respect of subscriptions outstanding at the year end. Subscriptions received in advance for future years are included in deferred income.

Funds

Restricted funds comprise unexpended balances of donations and interest to be applied for specific purposes. At 30 September 2010, the Society's only restricted fund was the Manton Fund. Designated funds are those set aside out of unrestricted funds for specific purposes. At 30 September 2010, the designated fund of the Society was the Scientific Meetings Fund ("S.M.F").

Cash Flow Statement

The Society has taken advantage of the exemptions provided in FRS 1 "Cash Flow Statements" for small entities and has not prepared a cash flow statement.

	Unrestricted General £	Designated S.M.F. £	Restricted Manton £	Total 2010 £	Total 2009 £
2 Grants, Studentships & Awards					
Travel awards for Winter Meeting	0.00	2,870.38	0.00	2,870.38	2,247.06
Awards for courses, travel, Summer Bursary	5,716.05	0.00	0.00	5,716.05	8,039.57
Manton Prize	250.00	0.00	250.00	250.00	250.00
Poster prize at Winter Meeting	150.00	0.00	0.00	150.00	150.00
Special Project Grants	4,283.06	0.00	0.00	4,283.06	2,000.00
Hilda Canter-Lund award	150.00	0.00	0.00	150.00	150.00
	<u>10,299.11</u>	<u>2,870.38</u>	<u>250.00</u>	<u>13,419.49</u>	<u>12,836.63</u>
3 Publication expenditure					
Journal	6,615.00	0.00	0.00	6,615.00	6,588.00
Editors' Honoraria (2009)	0.00	0.00	0.00	0.00	1,500.00
Editors' Honoraria (2010)	10,000.00	0.00	0.00	10,000.00	0.00
E.J.P. Management Committee	398.73	0.00	0.00	398.73	0.00
The Psychologist	3,491.00	0.00	0.00	3,491.00	4,297.20
EJP Editorial Assistant Expenses	551.32	0.00	0.00	551.32	2,322.47
	<u>21,056.05</u>	<u>0.00</u>	<u>0.00</u>	<u>21,056.05</u>	<u>14,707.67</u>
4 Meetings & Committee Expenses					
Council Meeting 2009	213.21	0.00	0.00	213.21	3,135.26
Council Meeting 2010	3,406.08	0.00	0.00	3,406.08	0.00
Biodiversity Committee Expenses	1,491.71	0.00	0.00	1,491.71	532.64
Winter Meeting 2009	0.00	0.00	0.00	0.00	14,059.70
Winter Meeting 2010	3,492.19	0.00	0.00	3,492.19	0.00
Federation of European Psychologists	945.64	0.00	0.00	945.64	0.00
FEEMS Meetings	0.00	0.00	0.00	0.00	205.38
	<u>9,548.83</u>	<u>0.00</u>	<u>0.00</u>	<u>9,548.83</u>	<u>17,932.98</u>
5 Administration Costs					
Public liability insurance	414.82	0.00	0.00	414.82	385.88
Independent Examiner's Fee	1,408.75	0.00	0.00	1,408.75	1,400.00
Credit Card Charges	554.47	0.00	0.00	554.47	849.55
Bank Charges	640.58	0.00	0.00	640.58	379.80
Executive Honoraria (2009)	0.00	0.00	0.00	0.00	3,250.00
Executive Honoraria (2010)	3,250.00	0.00	0.00	3,250.00	0.00
Federation of Bioscience Federation Subscription	0.00	0.00	0.00	0.00	486.00
Society of Biology Subscription	534.60	0.00	0.00	534.60	0.00

The British Psychological Society

Notes to the Account for the Year ended 30 September 2010 (cont.)

	Unrestricted General £	Designated S.M.F. £	Restricted Manton £	Total 2010 £	Total 2009 £
5 Administration Costs (cont.)					
General Expenses	0.00	0.00	0.00	0.00	(176.25)
FEMS subscription	427.24	0.00	0.00	427.24	387.71
FEPS subscription	289.45	0.00	0.00	289.45	327.78
Website Maintenance	1,000.00	0.00	0.00	1,000.00	2,485.71
Treasurer expenses	0.00	0.00	0.00	0.00	18.40
Miscellaneous (NHM overpayment refund)	0.00	0.00	0.00	0.00	1,500.00
	<u>8,519.91</u>	<u>0.00</u>	<u>0.00</u>	<u>8,519.91</u>	<u>11,294.58</u>

6 Reimbursement of Council members' expenses

Sixteen (2009: Seventeen) Council members received £4,700.45 (2009: £3,135.26) as reimbursement of travel and overnight accommodation for expenditures incurred during the year on Society business. No monies were paid to any Council member in respect of subsistence.

7 Debtors

	2010 £	2009 £
Interest receivable	429.48	2,000
Prepayments	3,475.81	5,700.00
	<u>3,905.81</u>	<u>7,700.00</u>

8 Liabilities: Amounts falling due within one year

	2010	2009
Accruals & deferred income	4,385.95	3,191.00
Provision for the <i>Journal</i> and <i>The Psychologist</i>	10,500.00	10,500.00
	<u>14,885.95</u>	<u>13,691.00</u>

9 Analysis of Net Assets between Funds

	Unrestricted Funds £	Restricted Funds £	Designated Funds £	Total Funds £
Fund balances as at 30 September 2010 are represented by				
Current assets	122,157.32	4,444.09	25,000.00	151,601.41
Current liabilities	(14,635.95)	(250.00)	0.00	(14,885.95)
Total Net Assets	<u>107,521.37</u>	<u>4,194.09</u>	<u>25,000.00</u>	<u>136,715.46</u>

Report of the Independent examiner to the Members of the British Psychological Society

We report on the accounts of the Society for the year ended 30 September 2010, which are set out on pages 30 to 32.

Respective responsibilities of trustees and examiner:

The Council Members are responsible for the preparation of the accounts. The Council Members consider that an audit is not required for this year (under section 43 (2) of the Charities Act 1993 (the 1993 Act)) and that an independent examination is needed.

It is our responsibility to:

* examine the accounts (under section 43 (3) (a) of the 1993 Act);

* to follow the procedures laid down in the General Directions given by the Charity Commissioners (under section 43 (7) (b) of the 1993 Act);

and

* to state whether particular matters have come to our attention.

Basis of independent examiner's report:

Our examination was carried out in accordance with the General Directions given by the Charity Commissioners. An examination includes a review of the accounting records kept by the charity and a comparison of the accounts presented with those records. It also includes consideration of any unusual items or disclosures in the accounts, and seeking explanations from the Council Members concerning any such matters. The procedures undertaken do not provide all the evidence that would be required in an audit, and consequently we do not express an audit opinion on the view given by the accounts.

Independent examiner's statement:

In connection with our examination, no matter has come to our attention which gives us reasonable cause to believe that in any material respect the requirement:

* to keep accounting records in accordance with section 41 of the 1993 Act and;

* to prepare accounts which accord with the accounting records and comply with the accounting requirements of the 1993 Act; have not been met.

Flannigan Edmonds Bannon;

Chartered Accountants and Registered Auditors

Belfast, Northern Ireland



The BTCV/SEPA Natural Talent Seaweed Apprenticeship

Ruth Crundwell

Ruth.crundwell@sepa.org.uk

"Hello, my name is Ruth and I am the seaweed apprentice" is an introduction I still love to say. I have been asked to write a short article for this publication after I gave a presentation at the BPS Winter meeting in Cardiff about my apprenticeship.

It is one of the Natural Talent apprenticeships that BTCV (formally British Trust for Conservation Volunteers) have set up with Heritage Lottery funding since 2006. This year has seen the final cohort of this scheme commence their placements. It was set up to train the next generation of naturalists and placements have trained individuals in either a taxonomic speciality or specialist habitat management skills to fill a recognised skills gap in Scotland and Northern Ireland.

Working in partnership with national charities, environmental organisations and regional trusts, the emphasis is on gaining skill and knowledge from experts, and to carry this expertise into future jobs in the conservation sector. My apprenticeship is the first marine based one and Clare Scanlan is my mentor. There are two components, 1; Learning the ecology and identification of macroalgae in order to assist with Scottish Environment Protection Agency (SEPA)'s monitoring programme. 2; To assist with 'Citizen Science' a SEPA initiative to encourage a greater interaction between the organisation and the general public.

The first 4-6 weeks after arrival in Aberdeen were spent collecting algae from local shores and working through keys and id guides in the lab. I also started to use a microscope in algal identification which has opened up a whole new world for me. It's very exciting to see what looks like a bundle of fibres be transformed into the intricate shapes of different species. Seaweed identification is notoriously difficult. There are many keys which are complex for a beginner to use. However a publication which I found very useful and uncomplicated is, "Green Seaweeds of Britain and Ireland" (eds Brodie J, Maggs C & John D). I found this to be well presented, with clear photos and illustrations and a text that is easy to follow. It is obvious that a great deal of work has been done to make it 'user friendly'. I wish there were equivalent publications for Brown and Red seaweeds too!

A new publication "Seasearch Guide to Seaweeds of Britain and Ireland " (Bunker F, Brodie J, Maggs C, Bunker A) is one I would have appreciated being available last year when I started. This is a great example of making seaweed identification less stressful and more fun for the amateur ecologist.

I have also taken part in other surveys for SEPA including a survey of saltmarsh near Dumfries and Macro Algal Blooming (MAB) work in the Eden estuary.



The other part of the apprenticeship is contributing to the SEPA Citizen Science initiative. I have spent time in the summer reviewing activities that are designed to raise public awareness of rocky shores. We are discussing possible mass observation projects with the BPS through the Biodiversity and Conservation Committee.

I was particularly pleased to be able to attend the BPS Winter meeting. It did feel daunting to be surrounded by erudite people who have made it their life's work to study algae. The first afternoon was so intense for me I wasn't sure how I could retain anymore information for the rest of the other days! But I was able to relate to the Thursday morning session chaired by Martin Wilkinson, which gave me the confidence I needed for the presentation I gave that afternoon. Although many of the topics were new to me, I found them fascinating and have taken away a new thirst for knowledge.

I am really enjoying my apprenticeship. It is a nice mix of science and working with the general public combined with field and office/lab work. With recent news of the extension of the apprenticeship through this summer I am hoping that I can instil the enthusiasm I have for macroalgae to the general public, in an attempt to get them as excited about seaweeds as I am.

Reflections on 60 years of Phycology and the BPS

To celebrate the 60th Anniversary of the British Phycological Society a one day extra special summer meeting is planned for June 2011. In preparation for the diamond anniversary and following on from last edition's article by one of the

past presidents (Professor Brian Moss), following are additional articles by past Presidents and past overseas vice Presidents reflecting on 60 years of phycology and the BPS.

First Time



Prof. Dr. Wytze T. Stam
University of Groningen,
The Netherlands
Overseas Vice-President
BPS, 1995-1997

In 1968 I started my PhD in the Department of Plant Systematics at the University of Groningen. Under the guidance of my supervisor, Chris van den Hoek, I started to work on the molecular taxonomy of blue green algae (there were no Cyanobacteria yet) using DNA-DNA hybridization (genomics *avant la lettre*). One of Chris' rules was to send beginning PhD-students to international meetings as soon as possible. So in 1970 it was decided that we (Chris van den Hoek, Anneke Breeman, Fransiscus Colijn, Hybo Rietema and I) would go to the 19th BPS Winter Meeting in London. It was a character-forming event.

First time #1: First airline flight ever. We flew from Rotterdam to Southend-on-Sea with the British Air Ferries (BAF) in an Aviation Traders ATL-98 Carvair. These four-prop airplanes carried 25 passengers and five cars, the former loaded in from

the back and latter from the front. The flight was some 30 minutes, but as soon as we left the Dutch coast behind the tax free box was opened and liquor sales commenced. The carrier has been known ever since as British Alcohol Ferries.

First time #2: Handling UK money. It was only a few weeks before Decimalization Day so the old complicated (to me at least) currency system was still up and running. The ticket agent at the Southend-on-Sea railway station simply raised his eyebrows.

First time #3: The tube. At that time there weren't many underground trains in The Netherlands (remember we live below sea-level) so my first ride on the underground was quite an experience. The Circle Line brought us to Baker Street and close to the meeting venue at the Bedford College in the Regents Park.

First time #4: Meeting the BPS

phycologists. Names that I knew only from the literature were suddenly real people I could talk to. I remember only a few: Bill Stewart, Brian Whitton, Frank Round and Gerald Boalch. Still it was a thrill and a little nerve-wracking.

First time #5: British dorm rooms. It was cold and the rooms could only be heated by feeding coins into a gas meter automat. Naturally, I did not have the right coins (see First time #2) but luckily my dorm-mate next door helped me out and this turned to be Irene Manton. It was the first and last time I ever met her, and I never paid her back.

First time #6: Shopping for presents for my kids in a shop in Baker Street. The saleswoman who helped me asked if I was "from the continent?" I had no idea where that country was.

Frankly, I do not remember a lot about the scientific content of the London meeting some 40 years ago but the many first-times and other impressions have stayed with me. For example, I do remember beautiful diatom-EM pictures shown by Robert Ross in his Presidential Address. Chris van den Hoek may have given a talk but the rest of us were there only to listen. We did not present posters because of the simple fact that poster sessions did not exist in 1971...

...and one more first time: In March 1971 the first British Phycological Society Newsletter (Ed. I. Tittly) was published. In the supplement that reported on the 19th Winter Meeting, it was noted that the meeting was attended by "a group from the Netherlands".

I thank the BPS for these first time experiences; I congratulate her with her 60th anniversary and wish her a prosperous and inspired future that will attract new generations of young, impressionable phycologists.



60 at BPS 60 and changing times...

Jeanine L. Olsen

University of Groningen, Netherlands
Overseas Vice-President BPS 2003-2005

1 952 was a good year. BPS was born and so was I. Looking back 60 years, 36 of which have been spent as a phycologist, I will reminisce, philosophize and look into my crystal ball. One thing's for sure, the future of algal research has never been brighter, but this is getting ahead of my story.

My first BPS meeting was in 1993 in Swansea. The dormitory had been shut down over the Christmas holidays and it was ice cold when we checked in. I met Chris Maggs for the first time and we headed off to the bar to warm up. I don't remember much about the meeting, but it was the beginning of our annual New Year's trek across the channel which was pretty much continuous until 2007 when my university changed the start of the Winter semester making it impossible for me to attend.

The big events for the society in the 1990s were certainly the change of the *British Phycological Journal* to the *European Journal of Phycology* and the debut of the first European Phycological Congress in Cologne in 1996. These events signalled the change from national to international thinking, which today seems totally self-evident with the World Wide Web...but that was not so 20 years ago.

Looking back

My phycological addiction occurred in 1976 during a summer course at the University of Hawaii taught by Roy Tsuda (University of Guam). A year later I was living in Guam, working with Roy and falling in love with the "siphonous greens". In my mind, most of these forms seemed primitive and therefore ancient. What was their evolutionary history and how could one find that out? Did simple morphology equate with primitive; were

the Dasyclads and the *Halimedes* and the *Avrainvilleas* and the *Caulerpas* and the *Boodleas* really hundreds of millions of years old? I had a ball with my projects and in 1980 started my PhD at UC-Berkeley in order to try and answer these questions. I'd never seen kelp and was, therefore, shipped off to Friday Harbor immediately for remediation. Back in Berkeley, I wanted to study the evolution of the algae. It was the early days of cladistics, there was no PCR, no DNA sequencing, no PCs... I was inspired by John West (culture work and development), Paul Silva (comparative morphology and the naturalist's spirit); and by Alan Wilson and Jerry Lowenstein (molecules and molecular clocks). We used protein immunological distance and, at last in 1985, I had my first glimpse of siphonoclad evolution.

In 1988 I went to the Smithsonian to help set up the new Laboratory of Molecular Systematics. PCR had just been invented and we were invited by Tom White of Cetus Corporation - one of the gurus and inventor of the "TW" rDNA-ITS primers at the company that marketed the first PCR machines. Sequencing was getting a little easier; on a good day we could generate 300 bp. I wrote a little article entitled, "Nucleic acids in algal systematics for the *Journal of Phycology* (1990 26:209-214) and proceeded to "find and grind" as many green algae as I could. We had entered the age of molecular phylogenetics. There were, of course, the morphology vs. molecules debates and some pretty nasty cladists, but in the end there was validation.

And then I moved to the University of Groningen in 1990, where Chris van den Hoek was keen to couple phylogenies with biogeography. I became fascinated and over the years shifted into phylogeography with a focus on the browns (especially fucoids) - having left my beloved tropical greens in the good hands of students and colleagues.



The 2000s saw the first diatom genome sequence and currently there are at least a dozen algal genomes completed or in the works. High throughput sequencing can generate billions of bp/day. We now sit in the world of multi-gene and whole genome comparisons.

Some philosophizing

It feels great to work on algae. At long last we have been vindicated from the not-so-collegial smirks from some of our zoological colleagues who feel sorry for us. Algae have emerged at the centre of eukaryotic biodiversity, as the principle drivers of photosynthesis on the planet and are now major contenders in the biofuels race.

For many of us oldies though, phycology was about natural history, taxonomy, autecology and life history studies, with a healthy dose of electron microscopy (which I hated). The phytoplankton crowd had a particularly hard time because the methods for sampling, culturing and analysis were extremely difficult. Today, I see a new generation of phycologists working on

many of the key phytoplankton (and some macrophytes - *Ectocarpus*, *Fucus*, *Porphyra*) groups in the context of gene expression, bloom dynamics, invasive species, symbiosis, lipid production, cell wall polysaccharide biosynthesis, marine genomics, stress ecology and adaptation, community dynamics of resilience and cascades... In short we have entered the era of systems ecology - from gene to ecosystem - and the algae play a major role, whether in open ocean pelagic or intertidal rocky shores.

Unhappily, I teach marine ecological genomics to students who have never had a course in phycology, basic botany or invertebrate zoology, as these courses are not offered in the regular curriculum. Students must find summer field courses. Fortunately, there are still a number of good ones but many students don't see their value. Nevertheless, I strongly maintain that knowing the organisms and how they interact with their environment - the basic definition of ecology - is key for learning to think and ask good scientific questions.

My crystal ball

Biology has been co-opted here in The Netherlands, being somehow considered separate from the Life Sciences. Such disciplines include biophysics, biochemistry, biotechnology, bioengineering, bioinformatics....bio-everything. But what about just plain "bio"? At the core, biology is about understanding the nature of life, its biodiversity, its evolution, and the complex interactions driven by extrinsic (abiotic/biotic) and intrinsic (genetic variation, selection, gene flow, drift and mutation) mechanisms.

The mark of the phycologist in 2012+ is someone who is cross-trained - a specialist in one or two areas but conversant in several. Inter- and cross-disciplinary research is the way forward and phycologists are positioned to take advantage of this. If you're a

20-plusser and reading this, take heart. Most of us were first attracted to the algae, then to methods and finally to questions. This is pretty normal; but ultimately, it's the questions that must lead and the more you know about your organisms *and* the system they live in, the better.

In the context of molecular systematics, whole genomes will become as common as 18S or rbcL gene sequences (as is already the case in models such as *Arabidopsis* and *Drosophila*). Quality phylogenies are still at a premium and need to involve several genes, good taxon sampling and Bayesian analyses. Because paraphyly is rampant, it is all the more important to look at the population/biogeographic levels. Algae are very malleable with respect to phenotypic plasticity (think about reds) as well as ecotypic differentiation (think diatoms, the beetles of the marine world). The latter happens on ecological time scales (think about climate change). Rapid but incomplete lineage sorting is one of the key reasons that phylogenetic studies in, for example, the Laminariales and Fucales (e.g., *Sargassum*), as well as my beloved siphonous greens are often unresolved and extremely messy. It's not just the markers; it's also the biology. We still know remarkably little about what maintains complex life histories, sex determination, reproductive isolation and development though work on *Ectocarpus*, *Fucus* and *Porphyra* is beginning to tackle some of these issues. The door is wide open.

Classical culture studies went out of fashion yet now, more than ever, we need this expertise. Just think about how many advertisements you've seen on Algae-L or EvolDir for algal biotechnology, biofuels and so forth. I know I'm getting carried away, but attribute it to passion and pre-senility. In short, keep your natural history and lab-skills up, but most important, think first about the special questions that have made you choose to work with algae. I won't be around for the 120th anniversary of BPS, but some of you will be.

“Winter Meeting” Memories

Mike Guiry
President 2005-2007



My first acquaintance with the BPS was the Winter Meeting of 1973 when I had the temerity to give my first presentation as a callow PhD student of David and Linda Irvine's from the wilds of Ireland. Those were the days of "formidable" lady phycologists such as Mary Parke, Mary Martin, Elsie Conway, Elsie Burrows, Máirín De Valéra, and so many other seemingly fearsome personages, most of whom were in reality kindly souls, even if they could be hard to approach for the skinny young lad that I used to be. The presentation, on a new species of *Cryptonemia* from Ireland (with Linda Irvine and Bill Farnham), the first new species to be described for the local flora for many a long year, was met with what seemed to me to be a frigid silence at question time. Out of the sea of faces (and the audience was a complete blur to me by then) came a question from Professor R.F. Scagel, a really famous phycologist from the University of British Columbia.

In those days you never could tell who might turn up at a Winter Meeting! I must have been able to answer to his satisfaction as we started a correspondence that lasted many years.

Other memories included the often-freezing and rudimentary student accommodation, so cold one year that I had to wear all my clothes and an overcoat in bed, and I ran out of shillings for the gas meter on another occasion for the gas fire, the only source of



heating in the room. At one Winter Meeting, the people who ran the accommodation forgot to give me the code to get in the front door and then went home before I could find their office. (Well, I had been in the pub, so it was partly my own doing.) I was eventually let in by David John, only to find that the place was a huge Heathrow-like maze, and I spent a good hour finding my room, which had no towels and no soap. Somebody remarked to the university subsequently that the place should be knocked down, only to be told that it was a "fine example of sixties tower-block architecture" and was "listed".

The formal dinners were great fun too. All the ladies had evening wear and the gentlemen jackets and ties (even me!), and sherry would be served at the pre-prandial get-together. The sherry often tasted like sweetened lab alcohol (woops), but it certainly warmed up the conversation. The BPS President toasted the Queen at the end of the dinner and made a little speech, and it was wonderful one year to watch Máirín De Valéra, daughter of Éamonn de Valéra one of the leaders of the Easter Rising in 1916 in Ireland (the only leader not to be shot because he had US citizenship), politely toasting Elizabeth II while smiling secretly in my direction.

One year I and my postgrads (including Chris Maggs) got marooned in London by snow, and we eventually had to go by bus to Bristol to get a plane back to Ireland. Chris's mother memorably gave us a huge bag of food that she seemed to conjure out of nowhere "in case we got stuck on the motorway" but in reality she probably thought that we had no money, which was not far from the truth.

Trevor Norton from the University of Liverpool, that best-selling rakish raconteur, could always be guaranteed to reduce the audience to tears of laughter with a talk. Who could forget the famous session of which he was chair when he introduced Matt Dring, as the "Matt that all the girls want to roll in"? Even Matt was a little lost for words.

The 25th Winter Meeting of the Society was in some ways the most spectacular of the Winter Meetings, and seemed to me to mark a watershed between the Society as conceived when it was founded, and the Society it has become. Most of the people involved with the development of the Society in the 1950s and 1960s gave papers, and in many cases it was the first and last time that I heard them speak. I hope that the 60th meeting will be as much fun as the last 38 years of Winter Meetings.

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The BPS in the (and now in its) **SIXTIES**

Matt Dring

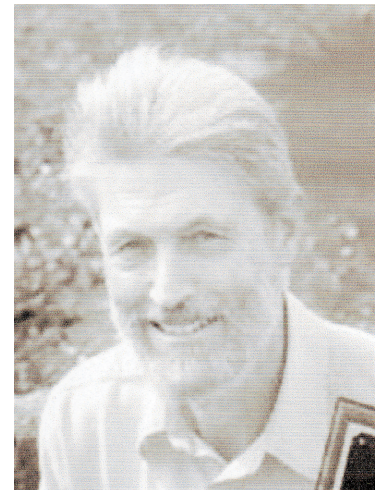
President 1993-1995

The first Winter Meeting that I attended - as a 1st-year postgraduate student - was in 1965 at University College London. All the Winter Meetings were held in London in those days - many in colleges (e.g. Westfield, Bedford, Queen Elizabeth) that haven't lasted as long as the Society. Although I cannot claim to remember that these were part of my first meeting, two talks presented in 1965 still stick in my mind - for quite different reasons.

One of these talks was not by a phycologist at all, but by an engineer, Professor H. Wright Baker, who had - I have just discovered! - played a major role in successfully unrolling the Dead Sea Scrolls (Johnson, 1999: *J. Materials Processing Technology* 94: 66-72). However, his appearance at the BPS was in another role - that of husband of one of the founder members of the Society and its first President, Dr Kathleen M. Drew. In a special session at the meeting, Professor Baker told "The Story of Nori in Japan" (*Br. Phycol. Bull.* 2: 497-500, 1965), and how the importance of Kathleen Drew's discovery in 1949 that *Conchocelis rosea* was the alternate phase in the life history of *Porphyra* (*Nature* 164: 748-749) had been quickly recognised by Japanese scientists involved in the seaweed industry. Within a few years, techniques for the mass culture of *Conchocelis* had been developed and, as a result, the harvests of *Porphyra* ("nori") in

the sea became far more reliable. The Japanese fishermen were so grateful to Kathleen Drew for the benefits that her discovery had brought that, after her death, they erected a simple memorial on a headland overlooking a major site of *Porphyra* cultivation. Professor Baker described the unveiling ceremony, which he had attended in 1963, when the fishermen had promised, apparently, to "renew their respects on the same day of each succeeding year". In 2001, they did more than this. They celebrated the centenary of Kathleen Drew's birth by decorating the memorial with her academic robes, and a colour picture of the decorated memorial appeared on the cover of the *Journal of Phycology* later that year.

The second talk from the 1965 meeting that I remember was a research paper given by Eifion Jones entitled (somewhat imprecisely!) "A quantitative approach to the exposure problem". Jones and his research student, Andreas Demetropoulos, had developed the first "dynamometer" (a disc attached to a simple spring balance) as a way to estimate the maximum drag force exerted by wave action on intertidal organisms. They had cemented 14 of these dynamometers to the rocks at a series of sites along the north shore of a bay in Anglesey and recorded the maximum drag forces throughout the winter. As would have been expected - but



had never been measured before - the drag forces near the head of the bay were much lower (about one-fifth) than those on the fully exposed headland. I remember to this day Eifion explaining, in his inimitable Welsh lilt, that the nearest land to the headland in the direction of the prevailing south westerlies was Brazil - giving a fetch of 6000 miles! This work was published in the new *Journal of Experimental Marine Biology and Ecology* in 1968 (Vol. 2, 46-63), and I included a full account of it in my textbook *The Biology of Marine Plants* in 1982. When working on a new edition last year, I read a lot of the recent work on wave dynamics and rocky shores, but none of it seemed to advance significantly on the ground-breaking work of Jones and Demetropoulos.

That's not a bad record for a single meeting of the BPS 46 years ago!

Liberated Phycologists



Joanna M Jones (Kain)
President 1987-1988

It seems to me that female British phycologists were liberated well before most women in Britain. The founders of the BPS were mainly women, they were in fulltime scientists and some had families. Most became presidents of the BPS. Some of them may have got on by being pushy, but not our first President, Kathleen Drew-Baker (Manchester), who was a gentle, self-effacing Quaker. Her two Vice-Presidents were older and almost rivals. They published algal floras in the same year: Lily Newton's (Aberystwyth) *A Handbook of British Seaweeds* was what we all used before we had *Seaweeds of the British Isles* organized by the BPS and Margery Knight's (Liverpool, with Mamie Parke) *Manx Algae* was not an identification aid so much as an meticulous ecological and phenological record. Professor Newton, a tall imposing woman who expected to be obeyed, became the second President. Margery Knight had by then retired from Liverpool, where she had been widely respected as Warden of University Hall, combining this with fieldwork on Manx shores where she

could be found far out at low tide even after she had lost a leg as a result of a car accident. In retirement she lived in the Isle of Man and concentrated on painting and potting. Her student Mamie Parke's (Plymouth) ebullient personality endeared her to everyone unless they transgressed. At the Plymouth lab the women's toilets were festooned with notices in her handwriting. She became an FRS in spite of being a woman, a Liverpoolian and a Catholic. Elsie Conway (Glasgow) was a formidable woman and edited the *Journal* when it was still a *Bulletin*. Margaret Martin (Bangor), a quiet and unassuming person, was treasurer for the first eleven years of the Society.

All these women, apart from Dr Knight, were President at some time during the first 20 years but somehow Elsie (Bunny) Burrows (Liverpool) missed out. She had not had an easy life: in her early career she had had to endure a misogynist as departmental head and her husband was killed rock-climbing. But later she managed to purloin (sometimes from the zoology department) a series of excellent students, including a future President. She was keen on classical music but once said that she wouldn't have minded if there had been no other composer than Bach. Another founder who did not become a president was Helen Blackler (St Andrews). She was a quiet, kind person who also had some very good students, including a future President. A shining example of early female liberation was Elizabeth Percival, who was actually a chemist with a passion for 'seaweeds'. Her first husband, also a chemist, with an academic post at Edinburgh University, died suddenly, leaving her alone with their with young children. She immediately applied for his job and got it. She was an enthusiastic member of the BPS and became President at its Silver Jubilee. Of younger vintage was Betty Moss (Newcastle-upon-Tyne) who was burdened by her faculty expecting her to sit on committees as a token woman.

By the time I came on the scene in 1950s, there were many role models of women in phycology mainly in universities. Much as I would have liked a post at the Plymouth lab, it is fortunate that there was not one available because I would have lost the job if I had married. Instead my employers, the University of Liverpool had no such archaic rules and even, when the time came, cheerfully offered three months maternity leave on full pay. On the other hand I was a little taken aback at my first faculty committee meeting when the Dean opened the proceedings with 'Dr Jones and gentlemen' . . .

In the first 20 years of the BPS there was gender equality in the presidency: 5 of the 10 presidents were female. But there have been only 4 women presidents in the subsequent 40 years, bucking the trend expected from social change. This accentuates the achievement of these early women in taking their rightful place in the academic scientific community at a time when there was still considerable prejudice against them.





Introduction to Freshwater Algal Identification

Professor Brian Whitton (Durham) and Professor David John (London)

Hild-Bede College and School of Education

University of Durham

Sunday 3 July - Friday 8 July 2011

Aim

To train staff from Environment Agency, SEPA, water plants, consultancies, research students and overseas visitors in the identification of the more widespread and environmentally important microscopic and macroscopic freshwater algae. Topics introduced include monitoring, harmful and nuisance algae and implications of the European Water Framework Directive.

Course Leaders

Prof. David John and Prof. Brian Whitton. Dr Gordon Beakes (University of Newcastle), Dr Alan Donaldson (consultant) and Dr Martyn Kelly (Bowburn Consultancy) also contribute.

Where

Hild-Bede College and School of Education, University of Durham (the two buildings are on adjacent sites).

Residence

and meals are in Hild-Bede College. The College is on a hill above the River Wear and has a fine view over the river and city; it also has an excellent reputation for food and drink. Arrangements can be made for special diet requirements. Parking is available inside the college.

Lectures

and/or practicals run until 2100 each evening, including the Sunday. Most study is in the laboratory, but there is one field visit.

Costs

The inclusive cost for all participants other than full-time research students is £900 (no VAT charge). The discounted price for full-time students is £750. Participants from overseas (whether or not a student) may stay one night in advance of the course free of charge. Students who are members of the British Phycological Society may apply directly to the Society for some support, but any decision rests with the Society. Details are on the BPS website, but it is recommended that any application is submitted as early as possible.

Participants who also attend the Advanced Course in the following week (Sunday 10th - Thursday 14th) may stay (bed and breakfast only) for the two intermediate days free of charge.

Hild-Bede College can also provide accommodation for people anyone else wanting to stay an extra night at the beginning or end of the course (cost about £35 for B & B). Payment can be included in the main invoice, provided organizers are told well in advance; otherwise it should be paid directly to the college after arrival. Dinner on Friday (but not bed and breakfast) will be provided free to anyone wanting to stay the night.

Booking

Provisional and firm reservations for one of 15 places should

be made by email to b.a.whitton@durham.ac.uk, to be followed by an official order OR a deposit of £50 to B.A. Whitton Algal Training, 74 Archery Rise, Durham DH1 4LA, UK. (This deposit need not be paid by overseas people.) Payment is required by 15 May. A full refund (excluding any deposit) will be made to anyone cancelling before 15 May, while 50% refund will be made to anyone cancelling by 15 June.

What to bring

Members are encouraged to bring boots for a short field visit and (preferably) fresh samples from their local waters. A few laboratory coats are available to be borrowed, but anyone coming from an organization where their own regulations require use of a coat for routine microscopy is advised to bring their own coat. Everything else is provided, including access to the Freshwater Algal Flora of the British Isles and identification CD-ROMs; a new version of the blue-green algal CD will probably be ready for the course. Some people may find it useful to bring their own portable computer, if it can be used for CDs and the risk of loss is covered by their own insurance. The 2009 training manual will be distributed in advance; if you have booked, but not received a copy by 1 May, please inform the organisers. Overseas members need not bring a laboratory coat or clothes for the field visit - these will be loaned.

Travel

Durham is on the main rail line between London King's Cross and Edinburgh. Trains are about once an hour and the journey from London (260 miles) takes three hours. Overseas members should contact the organizers for advice on buying their ticket. (Advance booking is essential to get the cheapest.) A taxi from the station to Hild-Bede College (about 1.5 miles, but a long hill for walkers) costs about £3.50. The nearest airport is Newcastle-upon-Tyne. **Avoid Teesside and Durham airport, unless this provides the only suitable flight.** There is a rail route from Newcastle airport to Durham, though this involves changing at Newcastle main rail station and the overall journey can take anything from one to two hours, depending on the connection at Newcastle. A taxi from Newcastle airport to Durham (26 miles) takes 35-45 minutes and costs about £45. The organizers usually collect members at the airport, but it may not be possible to help with the return journey.

Programme

All participants are expected to have read the Manual before joining the course!

The course (which has run since 1992) is a mixture of lectures and practicals, together with an afternoon field trip. Members should arrive by 1700 on the Sunday (though they can take their room earlier in the day), while the daily programme runs from 0900 to 2100. It ends formally after lunch on Friday, though there is an optional trip to sites along the River Wear in the afternoon. There is no formal test, but the course ends with a slide-show quiz and a prize for the winner.

David John and Brian Whitton give the majority of lectures. Gordon Beakes helps on the Tuesday; Alan Donaldson (special expertise blue-green algae/cyanobacteria) helps on several days; Martyn Kelly gives lectures and practicals on the Tuesday evening and Wednesday morning and afternoon.

Provisional schedule

Sunday

Introduction to freshwater algae
Optimizing your skills at identifying algae

Monday

Blue-green algae (cyanobacteria) 1 and 2
Use of interactive identification CDs
Overview of other algae
Practicals: Range of blue-green algae; mixed samples

Tuesday

Microscopy techniques
Green algae 1 and 2
Practicals Range of green algae
Field visit to Cassop Vale National Nature Reserve,
followed by microscopy of samples
Diatoms 1

Wednesday

Diatoms (mixed lectures and practical, including use of diatom CD)
Diatoms: taxonomy and techniques
Other phyla 2

Thursday

Red algae, flagellates and charophytes
Blue-green algal blooms
Ecology of river algae
Practicals Reds, flagellates and charophytes

Friday

Preservation methods
Algal nuisances and their control
Class revision
Slide-show quiz
General discussion, followed (after lunch) by optional tour to River Wear sites

Further information

Anyone wanting further information is welcome to contact **Brian Whitton:**
b.a.whitton@durham.ac.uk / phone 0191-386-7504.
or **David John:** d.john@nhm.ac.uk
or d_m_john@ntlworld.com / 0208-464-6367

5th European Phycological Congress

September 4-9, 2011 - Rhodes Island, Greece

Website is: <http://www.epcv.gr/index.html>

Deadlines: Abstracts by March 4, 2011; Early Registration by March 1, 2011 and Final Registration by June 6, 2011.

Featured Symposia include Environmental stresses on coastal marine algae, Algal biotechnology, DNA taxonomy: bar coding and species delineation, Cell biology and molecular physiology of algae; Molecular and cellular responses in algae induced by changes in the environment; Genetics of speciation (ecological and molecular); and Algal genomics; Freshwater algal biogeography and biodiversity.

Plankton 2011 Plymouth Meeting

September 22-23, 2011 - Plymouth, UK

Website is: <http://www.plankton2011.org>

Abstract submission is now open

To celebrate the 80th Anniversary of the Continuous Plankton Recorder Survey, The Sir Alister Hardy Foundation for Ocean Science will host Plankton 2011 - an international symposium on plankton biodiversity and global change in the aquatic systems. It will seek to identify causes and consequences of long-term changes in plankton communities in fresh and marine waters.

9th International Temperate Reef Symposium

June 16 - July 1, 2011 - Plymouth, UK

Website is: <http://www.itrs2011.org>

Oral and poster presentations are now being invited. In addition to open sessions on all aspects of temperate reefs, the following provisional themes are being considered: propagules to production, biodiversity and ecosystem function, management and conservation, artificial structures, contribution of reef research to general ecological theory, coldwater coral reefs, deep-sea reefs, macro-ecology and modelling, phylogeography and biogeography. Subject to demand workshops will be organised on the afternoon of the 29th June focussing on current methodological and conservation challenges.

Determination Course of Freshwater and Terrestrial Cyanobacteria

15th to 29th August 2011

The five day course is focused on determination of freshwater and terrestrial Cyanobacteria in context with modern taxonomical approaches. It consists of theoretical lectures of systematic classification, ecology and taxonomic criteria of Cyanobacteria, and of microscopic sessions with practical identification. Determination of participant's own material is possible.

One day is dedicated to excursion. Participants may choose between a "cultural trip" to famous medieval town and castle Český Krumlov or a "adventure trip", a canoe trip through the valley of Vltava river.

Lecturers: Jir í Komárek (main lecturer), Jan Kaštovský, Tomáš Hauer

Course language: English

Prerequisite: basic knowledge of Cyanobacteria

<http://www.phycology.cz/DCC>



Advanced Course on Blue-Green and Green Algae

Professor Brian Whitton (Durham) and Professor David John (London)

Hild-Bede College and School of Education

University of Durham

Sunday 10 July- Thursday 14 July 2011

Aim

To provide training on identification of blue-green algae (cyanobacteria) and green algae at a more advanced level than in the Introductory Course on Freshwater Algae. This course is planned especially for anyone who has attended one of the introductory courses, but also for others with considerable experience of field material or who would benefit from refreshing their knowledge. Methods for identification will include modern methods.

Course Leaders

Prof. David John and Prof. Brian Whitton, with contributions from Dr Alan Donaldson (consultant) during part of the course.

Where and when

Hild-Bede College and School of Education, University of Durham (the two buildings are on adjacent sites.) The course runs from late afternoon on the Sunday to 1600 on the Thursday, but accommodation (free of charge) will be provided for anyone wanting to stay overnight on the Thursday.

Residence

and meals are in Hild-Bede College. The College is on a hill above the River Wear and has a fine view over the river and city; it also has an excellent reputation for food and drink. Arrangements can be made for special diet requirements. Parking is available inside the college.

Lectures

and/or practicals run until 2120 each evening, including the Sunday. Most study is in the laboratory, but there will be a field visit on part of Tuesday.

Costs

The inclusive cost is £620 (no VAT charge). Full-time students who are members of the British Phycological Society may apply directly to the Society for some support, but the decision rests with the Society. Details are on the BPS website, but it is recommended that any application is submitted as soon as possible.

Hild-Bede College can provide accommodation for anyone wanting to stay an extra night at the beginning or end of the course (cost about £35 for B & B). Payment can be included in the main invoice, provided organizers are told well in advance; otherwise it should be paid directly to the college after arrival.

The combined costs for the Introductory and Advanced courses is £1420, including bed and breakfast accommodation for the two intermediate days and also (if required) one night in advance and one night at the end.

Booking

Provisional and firm reservations for one of 10 places should be made by email to b.a.whitton@durham.ac.uk, to be followed by an official order OR a deposit of £50 to B.A.Whitton Algal

Training, 74 Archery Rise, Durham DH1 4LA, UK. (This deposit need not be paid by overseas people.) Payment is required by 15 May. A full refund (excluding any deposit) will be made to anyone paying and cancelling before 15 May, while 50% refund will be made to anyone cancelling by 22 June.

What to bring

Members should bring boots for the field visit and (preferably) fresh samples from their local waters. All else is provided, though some people may find it useful to bring their own portable computer, if it can be used for CDs and the risk of loss is covered by their own insurance. The advanced training manual will be distributed in advance; if you have booked, but not received a copy by 1 June, please inform the organisers.

Travel

Durham is on the main rail line between London King's Cross and Edinburgh. Trains are about once an hour and the journey from London (260 miles) takes three hours. Overseas members should contact the organizers for advice on buying their ticket. (Advance booking is essential to get the cheapest.) A taxi from the station to Hild-Bede College (about 1.5 miles, but a long hill for walkers) costs about £3.50. The nearest airport is Newcastle-upon-Tyne. **Avoid Teesside and Durham airport, unless this provides the only suitable flight.** There is a rail route from Newcastle airport to Durham, though this involves changing at Newcastle main rail station and the overall journey can take anything from one to two hours, depending on the connection at Newcastle. A taxi from Newcastle airport to Durham (26 miles) takes 35-45 minutes and costs about £45. The organizers usually collect members at the airport, but it may not be possible to help with the return journey.

Programme

The course deals with blue-green and green algae; other groups are mentioned only if important in field samples. Representative material from a wide range of environments will be included in practicals, though particular attention given to organisms likely to cause identification problems during monitoring and survey programmes. Information on environmental aspects are included, especially those related to nitrogen and phosphorus sources, together with the use of taxonomy, morphology and staining to assess these.

The field visit includes the Sunbiggin Tarn region (Cumbria), which has a range of wetland areas, and a main river site (provisionally R. Eden).

All participants are expected to have read the Manual before joining the course !

Further Information

Anyone wanting further information is welcome to contact Brian Whitton:

b.a.whitton@durham.ac.uk / phone 0191-386-7504.

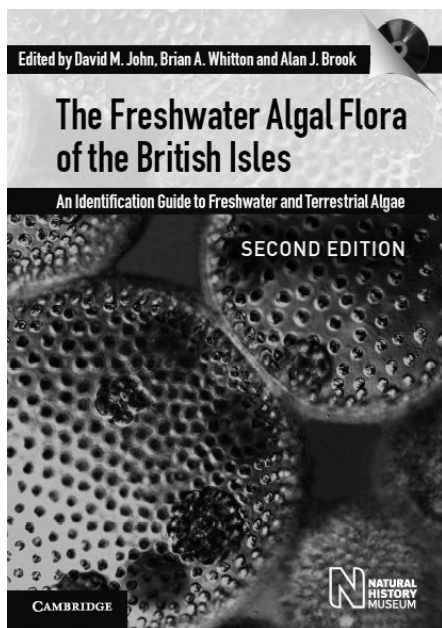
or David John: d.john@nhm.ac.uk

or d_m_john@ntlworld.com / 0208-464-6367

The Freshwater Algal Flora of the British Isles

An Identification Guide to Freshwater and Terrestrial Algae

2nd Edition



Edited by David M. John, Brian A. Whitton and Allan J. Brook
 ISBN 9780521193757
 Publication expected May 2011
 List price £125. Discount offer of £93.75 to members of the BPS.
 Offer expires 30 June 2011.

BPS members can order discounted copies on the CUP web page www.cambridge.org/ALGAL. Once the book(s) is added to the basket it will be necessary to the type 'ALGAL' (in capitals) in the discount code box on the top of the page to receive the 25% discount.

The 'The Freshwater Algal Flora of the British Isles' is a collaborative project of the British Phycological Society and the Natural History Museum, London. The second edition is an up-to-date account and identification tool for the large majority of the more than 2480 algal species (excluding diatoms) known from the British Isles. It is about 170 pages longer than the first edition and includes five additional figures and 39 new plates (193 in total) eight are in colour and five are halftones. The second edition includes a DVD rather than a CD and this contains a much expanded version of the original photo catalogue, several highly illustrated articles, a powerpoint presentation and video clips. The original contributors have been joined by Dr

Chris Carter, Dr John Day (Scottish Marine Institute), Dr Jan Krokowski (SEPA), Dr Fabio Rindi (University of Ancona, Italy) and David Williamson.

This second edition has been prepared as a response to the number of new species reported from the British Isles and the many significant taxonomic changes since publication of the first edition in 2002. Many of these changes are the result of molecular studies which have led to taxonomic re-alignments, recognition of cryptic species, redefinition of well-known species and have sometimes led to the splitting of genera and revised our understanding of phylogenetic relationships. The impact on taxonomy and classification of such investigations has been much greater in some groups than others. For example, the chapters on the Euglenophyta and Dinophyta (formerly Pyrrophyta) now contain several recently recognised genera and the classification of the Chlorophyta has undergone a major revision. Other chapters have been considerably enlarged such as the one on desmids which now includes almost half of the desmid flora of the British Isles (now co-authored by Allan Brook, David Williamson and David John). Accompanying the desmid chapter are new figures illustrating the terms commonly used in descriptions and 12 new plates of line drawings. The chapter on Cyanobacteria (Cyanophyta) has been considerably enlarged and revised, with additional keys and includes 60 species not in the first edition. The scope of the Flora has been widened to include 'colourless' (non-photosynthetic) euglenophytes, cryptophytes and dinophytes. Other new additions include a section on strains of British freshwater algae in major culture collections (John Day) and another on the EU Water Framework Directive (Jan Krokowski). Also taken into account in preparing this edition is newly acquired information on habitats and distribution patterns within and outside Europe.

The new edition has more than 200 additional species compared to the first edition with the majority of these members of Cyanobacteria and Chlorophyta. Most are new records and others are some species which had been

overlooked when compiling the first edition. Some of the new records were in lists produced by the Scottish Environment Protection Agency (SEPA), Environment Protection Agency (EPA) of Ireland and the Centre for Ecology and Hydrology (CEH). These new records are only accepted if verifiable otherwise they are considered doubtful and are mentioned as 'in need of verification'. In the first edition records were only accepted if published or provided by experienced and well-respected professional or non-professional phycologists. A number of the new records are those of the editors and were acquired on recent excursions to collect algae in the west of Ireland and the Outer Hebrides.

The DVD contains a new version of the photo catalogue of algal images and habitats, a downloadable version of the Flora bibliography, a revised Coded Checklist of British freshwater and terrestrial algae, a list of cultures of British freshwater algae by John Day, a powerpoint introduction to cryptophytes by Franco Novarino, five highly illustrated articles by Chris Carter (including video clips), an article on Vaucheria by Chris Carter and Roy Merritt and an article on William and George West by David John, Rob Huxley and David Williamson. The new version of the photo catalogue contains almost 1,450 algal images of 560 species and has been compiled by Peter York, David John and Chris Carter. Allan Donaldson and Brian Whitton have organized the contents of the DVD.

We wish to thank the British Phycological Society, the Scottish Environment Protection Agency and the Environment Agency for providing financial support to produce the second edition. Our thanks also go to all those who have assisted us in preparing and bringing the second edition to a successful conclusion.

David M. John and Brian A. Whitton
 Department of Botany, Natural History
 Museum, Cromwell Road, London SW7
 5BD and School of Biological and
 Biomedical Sciences, Durham University,
 Durham DH1 3LE



Frank Eric Round, 9th May 1927 - 25th October 2010

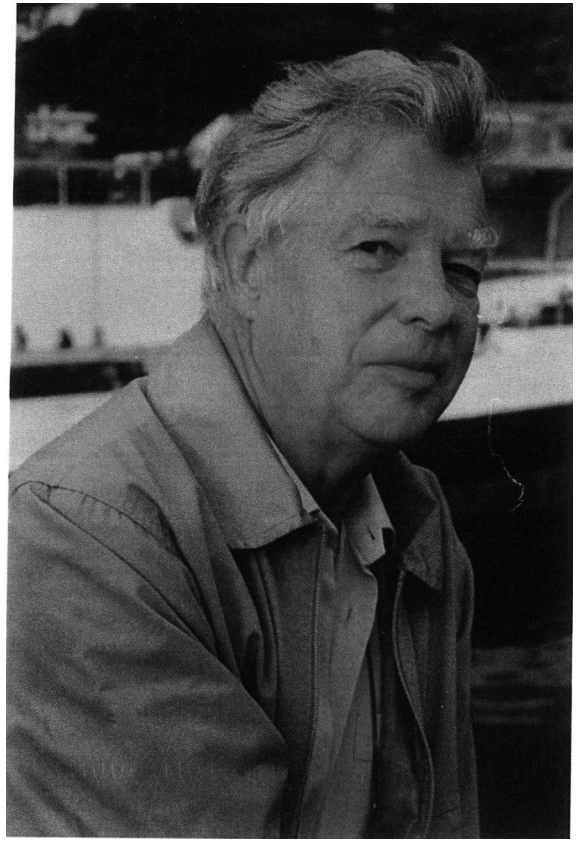
In 2006 many of us contributed to a volume that was dedicated to Frank Round, entitled "Microalgal biology, evolution and ecology". That volume contained a diversity of papers, reflecting some of the diversity of Frank's own phycological output, but also, in the geographical spread of the contributors, reflecting his contacts and influence throughout the phycological community. Appropriately therefore, this talk includes reminiscences and information provided by other individuals, as well as photographs from different times and places. I am very grateful to all who have contributed.

Frank was born in May 1927 in Handsworth, Birmingham, where his father was employed at the wire works. He had already started at Handsworth Grammar School at the outbreak of War in 1939, but with encouragement from his father to be independent, and the School operating only in the mornings, Frank spent afternoons cycling in the countryside. When the bombing started, he joined the fire-watch and had an exciting time extinguishing incendiary bombs with buckets of sand. Summers were spent working on a farm, which he loved.

In the sixth form Frank was inspired by the teaching of a new botany graduate and matriculated from school when the War ended in 1945. He went to Birmingham University to read Botany, from which he graduated with a first class degree in 1948. He then registered to do a PhD at Birmingham, working for the first year on algae in lakes with Dr John Lund at the Freshwater Biological Association, at that time based at Wray Castle in the English Lake District. It is unclear what first attracted Frank to the algae. Although Birmingham had a tradition for phycological studies in the early part of the 20th century (William West and his son George S. West), this tradition had faded by the time Frank was there.

After that year in the lakes, Frank had planned to return to Birmingham to complete his PhD studies, but took an Assistant Lectureship for two years at Liverpool University. He returned to Birmingham in 1953, when he was appointed to a lectureship in Botany, being awarded his PhD in 1954, with Tony Fogg and John Lund as internal assessors, and Heslop-Harrison, the external. Some of his first papers documented his studies on algae in the ponds of the then Botanic Gardens. Apparently Frank was not comfortable with the Oxbridge set that dominated the University at that time, contrasting with others in the department by being local and grammar school. That attitude to Oxbridge was never really lost - twenty years later, he was sceptical when I tried applying to Oxbridge colleges for a post-doctoral fellowship, but pleased when I succeeded.

In 1951, Frank had married Marie Hunt, another Botany student at Birmingham whom he met on a field course when he was in his second undergraduate year, and whose support over the following 59 years undoubtedly greatly facilitated his research and career. In 1955, Frank and Marie moved to Bristol, where Frank was appointed to a University Lectureship in Botany. He stayed in Bristol for the rest of his career, being



appointed Reader in Phycology in 1967, Dean of Science Undergraduates in 1973, Academic Head of Botany in 1977, and to a Personal Chair of Botany in 1979. He became Dean of Science in 1982 but took early retirement in 1984 to return to research, which he continued to do into his 80s.

Although Frank spent his career at Bristol, he travelled widely. He spent nine months at Scripps Institution of Oceanography, San Diego, California; three summers teaching and researching at the Marine Biological Laboratory, Woods Hole, Massachusetts, as well as researching algae on visits to aquatic habitats around the world, including the United States, Australia, India, South America, Israel and several European countries. He established an international reputation for his work on algae, and was awarded a D.Sc. by the University of Birmingham in 1965, the Medal of the Linnean Society in 1994, and a PSA Lifetime Achievement Award in 2005.

Frank may not have moved around in his career, but he was a faithful supporter of several scientific societies, particularly the BPS of which he was President (1973-4) and later an honorary member, but also played a key role in the development of the International Diatom Society, as well as in the establishment of Diatom Research, now in its 26th year. Until this year, when it will start to be published by Taylor & Francis, that journal was published by Biopress, a small publishing company, which Frank co-founded and developed. Frank was also largely responsible for establishing the rather shorter-lived Progress in Phycology series, which nevertheless

contained some highly significant reviews.

His own publication record was substantial - over 170 papers, covering a range of topics, although freshwater algal ecology and diatoms dominate, plus the books: *The biology of algae*, *An introduction to lower plants*, and *The ecology of algae*. Then, in 1990 with Dick Crawford and David Mann, the book that everyone knows, *The diatoms - biology and morphology of the genera*.

Tony Walsby said that Frank's legacy was the number of his PhD students who went on to distinguished academic careers, including Paul Broady, Dick Crawford, myself, Keith Crabtree, John Eaton, Chris Happey-Wood, Mike Hickman, Andrew Leitch, Brian Moss, David Mann, Roger Tippet. However, there were many others (I didn't dare attempt to list them for fear of missing someone), and even those who did not necessarily pursue long or high profile academic careers often made significant scientific contributions. Frank always encouraged independence, but few of us strayed far from the algae and their ecology. It might also be added that, over the years he nagged and pestered several of us to submit for DSc's. In the end, 5 of us were awarded DSc's - not a bad record for one supervisor.

For many of us, our first contact with Frank was as undergraduates, listening to his lectures. In the early 1960s he taught the spring term course on plant evolution, the lower plants up to the Gymnosperms in about 5-6 weeks, without lecture notes! Apparently he scaled the lectures according to the duration of plant groups, most for three billion years of algal development, and a few lectures to cover the half billion or so for the rest of the plant kingdom. As far as he was concerned, algae were the rulers of the world. According to Brian Moss, Frank pointed out a filmy fern on a subsequent field course, which nobody recognised. 'I lectured on that' he said. 'We must have blinked' was the retort.

But it was probably his second year course on Limnology and Oceanography that captivated most of us, when Frank would walk into the lecture hall, put some slides in the projector, pick up the chalk and start talking. Chris Happey-Wood found it absolutely fascinating and got hooked. It similarly caught Brian Moss's attention - as he said "With a sheaf of reprints open on the bench, he ad-libbed of a fantastic world where, below the surface of a lake, great changes in chemistry and layering, algal populations and production were taking place. He introduced us to the idea of great glaciers carving out basins from solid rock, of how the rubble of ice action led to a flush of diatoms, to be later starved of nutrients as the land settled and vegetation started to hold the minerals for its own. He told us how to measure production by the uptake of radioactive carbon added to the water, but didn't feel it necessary to mention that you put the water into a bottle first. We were supposed to be intelligent and realise that." Fortunately Brian later read some fuller instructions and avoided contaminating the Norfolk Broads with radioactivity and throwing East Anglian tourism into panic.

What many of us will also never forget is being introduced to the algae in Plymouth. Frank ran a week's field course for second year undergraduates, which effectively comprised a short collecting trip and then hours in the laboratory looking at whatever caught our fancy (sometimes the view of boats in

Plymouth Sound, or the animals in their samples), with the MBA library for follow-up. He was effectively introducing us to independent research. Of course, we remember the non-science too, for some, being introduced to the old part of the Hoe, the best fish and chip shop or a fantastic Elizabethan restaurant in the Barbican on the last night. Chris Happey-Wood remembers going as a demonstrator and being invited with Frank into Mamie Parkes office for a drink. The gin was kept in the bottom drawer of the filing cabinet! For me, I'll never forget having to fillet and cook fish I had never seen before, brought in that day on the MBA research vessel, when it was my turn to prepare dinner for the rest of the group in the kitchen. We also discovered that Frank liked his beauty sleep, and did not appreciate the fact that several of us would congregate in the bedroom adjacent to his to play bridge late into the night!

Staying on to do a PhD with Frank was something that seemed to emerge rather than being carefully planned, and his students tended to take their projects in the direction that they wanted, rather than Frank dictating the direction. For Brian Moss it was assumed that he would stay with Frank for a PhD, although Brian is not sure how that decision was made on either part - the youth, the debonair air, the sports car, the wonderful photograph of a beautiful family in the window of the photographers on Queens Row; or just fate. Apparently Frank tried Brian out on electron microscopy in which Frank's interest was developing, but at which Brian says he was abjectly clumsy, so was allowed to concentrate on ecology (which was clearly the right thing to do!). Chris Happey-Wood, having done an honours project on vertical migration in epipelagic algae, was similarly given minimal guidance - told to start investigating the ecology of small chlorophytes and 'how about culturing them' and then left quite a lot to her own devices in the lab on the ground floor. When I started, Frank was off on one of his overseas trips, so it was a case of, "carry on with what you were doing for your Honours project and we'll finalise it later". In my case, it was almost a year later that the final topic was settled, but then he had managed to get me appointed (without warning me beforehand) as a departmental demonstrator, with a 5 year contract rather than a 3 year grant!

Frank's philosophy of supervision was eminently hands-off, and fortunately, that suited most of his students down to the ground. He would come down to the lab every day, enquiring "Everything OK?", to which the usual reply was "Yes". There might then be some conversation, not necessarily to do with science, after which he would go back upstairs to do his own research. However, hands-off did not mean disinterested, and he was very good at remembering potentially relevant literature. There's a paper by so-and-so, I think it's in such-and-such a journal from about 19-something. He was invariably correct.

For Paul Broady, who was working in Antarctica, supervision was long distance, but Paul wrote that, "I always looked forward to Frank's letter which arrived on the first boat of summer when I was in the South Orkney Islands. So I had two of those, in 1972 and 1973. They were written in his distinctive hand-writing and were always encouraging and renewed my energies - seemingly simple but perceptive suggestions for further studies and interest in what had been achieved (which initially was not much!). Other than that there was the



occasional teleprinter message (limited to 200 words) and they were in similar vein."

Paul also recalled visiting Frank before he went to Antarctica and had strong memories of Frank's room - "his microscope with a huge pile of drawings of mostly diatoms by its side (from samples from Africa and all other points of the compass), a massive pile of paper which seemed to be on the verge of tipping over (a draft of his 'The Ecology of Algae') and a very ordered and huge number of cardboard file boxes with his reprint collection interspersed alphabetically with his phycology books." Paul also commented that "All in all, his low-key but effective supervisory style was masterful."

"Just pop it into culture" was often heard from Frank in the lab, although I don't believe he ever cultured anything himself - that was Carole, his technician's, job. However, Margaret Harper remembers that he was very tolerant of her stopping attempting to culture diatoms and encouraged her exploration of diatom locomotion, a topic that most contemporary diatomists did not think would lead anywhere (but was picked up by a later PhD student). Margaret also said that Frank's conversation at that time revealed that he had particularly enjoyed recent field work with John Palmer studying algal migration rhythms on estuarine mud (and getting muddy). Essentially if we could convince Frank that what we were doing was interesting and relevant, he was happy for us to have our head.

Frank's contacts with other phycologists also meant that we often met visiting scientists, and were encouraged to talk to them. I'll never forget seeing Ralph Lewin sitting on a high stool in the lab just talking with us about algae. Frank recognised the value of publications, but never insisted on being included as a co-author just because he was the supervisor. As far as he was concerned he was a co-author only if he had contributed significantly to the research. He was a breath of fresh air, in comparison with the majority of the other, very formal, academic staff in the mid-1960s.

It was Frank's interest and encouragement of younger phycologists that most remember. It seems that an introductory course in phycology given by Frank in Hawaii, was the inspiration for Linda Medlin (who had gone on the summer school there as a way of having a cheap holiday in an interesting place, choosing 'plants of the sea' rather than 'hula dancing') to work in phycology. Nelson Navarro remembers meeting Frank at the Harbor Branch Foundation in 1980 during Nelson's postdoc and collecting algae with him in the Indian River, Florida. Frank made several suggestions and helpful comments on a new genus that Nelson had erected. Similarly, Mark Edlund was impressed that Frank would go out of his way to engage students at meetings, remembering talking to Frank at Mark's very first meeting, the North American Diatom Symposium in 1987, and thinking "wow, I'm talking to Dr Round!" He commented that there could have been an ulterior motive, to sell subscriptions to the recently



initiated Diatom Research (for which Mark promptly signed up, even buying volume 1 from the previous year), but probably not. Frank knew and understood that students were the future of the field and that interactions with them benefitted both parties. Similarly, Frank sent a reprint request after Mark published his first paper, noting that he was glad that more observations had been added to one of his earlier preliminary studies, and that he would value a reprint as a bench reference. "Those interactions made a young diatomist feel mighty welcome in the scientific community" (Mark Edlund).

Another recollection from Koenraad Vanhoutte, at the University of Gent, was Frank's keen interest for the work Koenraad was (trying) to do, i.e. diatoms of Tasmania. Koenraad said that at that time he was all thumbs regarding diatoms and taxonomy, and given the ridiculous level of endemism in Tasmania, he was impressed that Frank bothered to take the time out of his busy schedule to give him and his fellow students some pointers on how to deal with the tricky ones.

With respect to students, Frank could wax philosophical, figuring that 90% of the comments students usually heard were corrective and negative, but that he strove to turn those statistics around. He intended to praise and encourage 90% of the time, and criticize 10% of the time. Meanwhile rules for new lecturers included, not to reply or respond to any request at the first ask, otherwise you never get any research done.

One thing that Frank never did was to move into the computer world. He always wrote by hand, and in more than one language. He liked to practice his Spanish, and Nora Maidana remembers writing her e-mails in Spanish, which were then printed out by Gill Lockett. Frank would answer by airmail, in his tiny and (to Nora) beautiful handwriting (which became increasingly difficult to read) but always full of useful advice. Because that handwriting became so difficult to decipher, Mike Sullivan wished that Frank had learnt how to e-mail, so that he could have corresponded with him more in the later years.

However, although he was frequently a stimulus for new

developments, Frank could also miss opportunities and fail to see other people's points of view, perhaps particularly when it involved publishing. Richard Gordon regrets that Frank refused to do a special issue of *Diatom Research* on diatom nanotechnology. Richard had wanted to see *Diatom Research* become the central venue for this topic, but the papers from a NADS diatom nanotechnology workshop were published instead in the *Journal of Nanoscience and Nanotechnology*. There were also disagreements over the editing and publication of some diatom symposia proceedings. For example, Herman van Dam remembers that Frank wanted to edit the proceedings of the 12th IDS (1992) but that the Dutch-Flemish diatomists felt that the scientists from the organizing country should do this. The other conflict was over the publisher - Herman going to *Hydrobiologia*, because it was more widely available than the symposium volumes published by Biopress. In the end the proceedings appeared within a year of the symposium, rather faster than usual! Frank was and still is admired for his research and his books, but he could be awkward and uncompromising. Perhaps Frank's attitude to publishing reflected that his career had developed in a time before citation indices; he valued the quality of the work more than where it was published.

On a lighter note, Paul Hargraves remembers that, in 1965, between finishing his M.S. and beginning his PhD studies, he was selected to attend the Marine Botany course at the Marine Biological Laboratory in Woods Hole. "Frank was one of the instructors. There were field trips around New England to sample the phycoflora on a regular basis, with the instructors providing transportation in their own cars. Frank had bought a 1954 Buick for the summer - a dinosaur of a car if ever there was one."

On one such trip Paul and four others rode with Frank to a site about 50km distant. "It became abundantly clear that he was unused to driving on the right. The field foray was excellent; the transportation terrifying. Frank's version of the event was that the curbs [kerbs to you] were continually jumping out at him as we travelled. The rotaries [roundabouts to you] were clearly a challenge to be attacked and overcome. By the time we returned to Woods Hole, the shaking of the old Buick was intense due to the injuries to tires and wheel rims. Everyone survived, but, as I recall, Frank was excused from future responsibilities in student transport."

Finally, Peter Siver recalls that "on a hot, very hot, summer day in northern Minnesota in 1984, there was a field trip as part of the Chrysophyte Symposium. The symposium had split up into several groups, and I was in the group with Frank, as were two very attractive Danish girls. It must have been 100°F with humid and heavy air. One of the Danish girls says, more or less to the group, 'Does anyone mind if we take off our tops?' I do not think a second passed before Frank piped up, 'Not at all'. But, immediately, a staunch older German woman said with a stern voice 'Don't you dare' and with that nothing else was said. A minute later Frank walked passed and said, 'What is that old German doing here anyway, she does not even study chrysophytes?'"

Of course it might be added that, strictly speaking, neither did Frank!

So, what is left to say?

Frank didn't play politics or indulge in gossip about

colleagues; he was more interested in science, and in that he was always open, honourable and independent, and worked very hard. He taught by example about the importance of publishing, about learning where to draw the line, write up the work, and move on. He challenged prevailing paradigms and encouraged us to do the same, and would point out that it wasn't the end of the world to make a mistake, but it was important to be able to correct one's own mistakes. He was always encouraging and interested in what we were doing, and never pulled rank - hence his consistent openness and helpfulness to students, amateurs and newcomers. Probably the saddest aspects of the last few years of his life were, that his memory was not what it was, that he lost confidence in his ability to recognise different taxa, and was unable to finish his ambitious work on British rivers. However, his legacy lives on in his written words and published works, through those of us who learnt from him directly, and in turn from those whom we have trained. Frank's phycological heritage was European, back through John Lund to Fritsch, but it has spread out throughout the world, east to west, north to south.

Eileen J. Cox, 7th January 2011

Acknowledgements

I would like particularly to thank all those who sent memories (and images) of Frank, whose words I have variously included or paraphrased. I am particularly grateful to Tony Walsby and Brian Moss for allowing me copies of their tributes given at Frank's funeral in November. Similarly, I am grateful to all who talked to me about Frank, their memories coloured the text. There is much more that could have been said, but I hope that the above captures the essence of the man. Certainly the phycological world will miss him, but is the richer for his contributions.



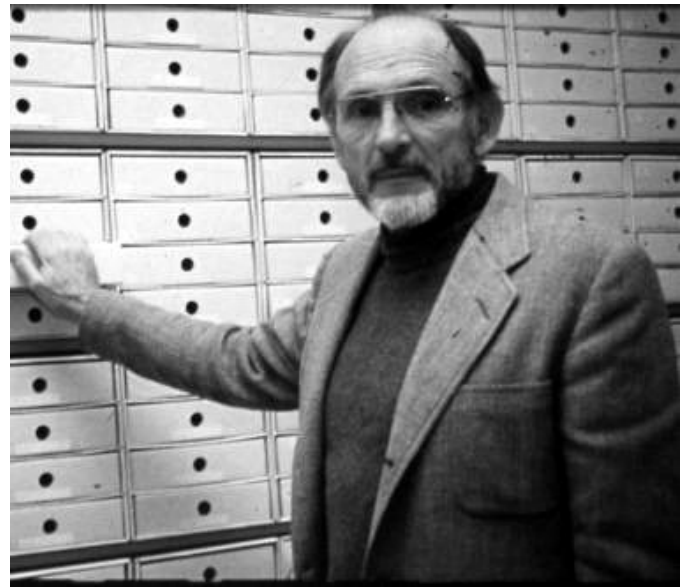


Jack Lamont McLachlan, Ph.D., F.R.S.C., 1939-2010

I regret to report the death of Jack McLachlan on December 13, 2010 after a lengthy illness.

Jack was born in Huron, South Dakota, and received his university degrees from Oregon State College in Corvallis. He spent most of his career, from 1961 to 1991, at the Halifax laboratory of the National Research Council of Canada (now known as the NRC Institute for Marine Biosciences). Although originally a specialist in microalgae, Jack soon adapted to the laboratory's emphasis on macroalgae and worked on the distribution, ecology and life histories of northwest Atlantic seaweeds. In the process he developed his own culture medium and founded the laboratory's marine algal herbarium (NRCC, now at NSPM). His great interest in seaweed resources led to long and distinguished service with the International Seaweed Association and extensive travel to seaweed-producing areas under the auspices of various economic and resource development agencies. Later in his NRC years, Jack returned to microalgae full-time as part of a major program on shellfish toxins, and retired in 1991 as a Principal Research Officer. He then moved his professional base to Acadia University and later St Francis Xavier University at both of which he had adjunct status while at the NRC. In the late 1990s, Jack relocated to Victoria, British Columbia, and embarked on an inventory of the microalgae of the local watershed area, which engaged him until he finally moved to Vancouver after the death of his wife Dorice in 2001.

American by birth, Canadian by naturalization, and a citizen of the world from his travels, Jack had a soft spot for the British Isles and the BPS. He chose the Plymouth laboratory of the Marine Biological Association as the base for his 1967 study leave (a once-only event in the NRC), where he worked



with Mary Parke on both micro- and macroalgae. He attended annual meetings of the BPS as often as circumstances and distance permitted, and served as the society's Vice-President in 1988-91. In 1992-93, he returned to the MBA laboratory on a Ray Lankester Investigatorship.

Jack is survived by his second wife, Doris, his children Ian, Stuart and Sarah, grandchildren and extended family. A detailed account of his career, with its attendant achievements and honours, is published in *Phycologia*.

Carolyn J. Bird

H.B.S. Womersley (1922-2011)

With sadness, I must report the death of Hugh Bryan Spencer Womersley (19 November 1922 - 16 January 2011), author of the monumental six volume work *Marine Benthic Flora of southern Australia* (1984-2003) and numerous other publications from 1946 onwards dealing with the systematics and ecology of southern Australian marine algae. Bryan's professional career was based at the University of Adelaide, where he became Professor of Botany in 1974 and was appointed Emeritus Professor upon his retirement in 1987. He also held the positions of Honorary Associate and Curator of

Algae at the Botanic Gardens of Adelaide and State Herbarium, where his collections are permanently housed. A 75th birthday tribute (including portrait) appeared in 1998 in *Botanica Marina* 41: 1-5, and a portrait and brief biographical information also appeared on p. 176 in an article (*Phycologia* 40: 172-181) honouring the Presidents of the International Phycological Society from 1961-2001. Bryan is survived by his wife, Alleyene, and sons Robert and Peter.

Bill Woelkerling

Michael R. Droop

Dr Michael R Droop, late of the Scottish Marine Biological Association (now SAMS), sadly passed away (20th March) aged 92 following a stroke.

His algal research began as a student of Pringsheim in Cambridge and he continued this when he came to Scotland in 1953. Michael Droop established an algal culture collection at the SMBA to support his studies and, as a result of this, the entire Culture Collection of Algae and Protozoa is now located within the same institution.

A full appreciation of his life and work, written by Barry Leadbeater, was published in *Protist* Volume 157, Issue 3, 23 August 2006, Pages 345-358. *The Phycologist*, Autumn edition, number 77 also details about Prof. Pringsheim and Dr. Droop at CCAP.

Christine Campbell

Instructions for Contributors

Copy which is submitted for publication in *The Phycologist* should be concise and informative. Articles should be scientifically sound, as jargon free as possible and written in a readable scientific magazine style. Unless absolutely essential, references should not be included. All types of relevant material will be considered, these include job advertisements, scientific reports, book reviews, news items of topical interest, meeting announcements, grant awards, promotions, appointments, profiles of eminent phycologists and obituaries. If you are interested in submitting material that does not fall within any of these broad categories, or you are unsure of the appropriateness of a potential article, then contact the editor. Suggestions for future articles or a series of articles are welcomed.

Copy should be submitted, preferably as attachments to email or on disc (MS Word for Windows or Rich Text Format). **Illustrations and photos to accompany copy are welcomed and should be supplied in JPEG or TIFF file-format no less than 600 dpi resolution.** The editor reserves the right to edit the material before final publication.

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