

CYANONEWS

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CYANONEWS is intended to provide cyanobacteriologists with a forum for rapid, informal communication, unavailable through journals. It relies entirely on news provided by its readers. Please send news, requests, publications, comments, etc. to the address below. DEADLINE for the next issue is NOVEMBER 1, 1986. If you wish to be included in the mailing list, send your name, address, telephone number, and a brief description of your research interests to:

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The people listed below have agreed to serve as clearinghouses for Cyanonews in their respective countries:

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Norway	OLAV SKULBERG	
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If you live in one of these countries, this explains why the newsletter arrived by local mail. "Clearinghouse" means different things depending on particular circumstances, but the idea is the same: to aid intercommunication amongst cyanobacteriologists. Any others interested in helping out in their regions please contact me!

This issue marks the second year of Cyanonews' existence, perhaps A GOOD OCCASION TO TAKE STOCK. The newsletter has received and published items in three areas: News, Announcements, and Publications. The Publication section has listed articles by correspondents, most of them published in the last two years. Occasionally an abstract of an article has been printed prior to publication. Announcements received have included Post-doc openings, notices of meetings, and the availability of a useful antibody. Timely notices of meetings have been scarce, largely because I don't hear about very many meetings. If you get wind of an interesting meeting, please send it along. News has consisted of brief reports concerning a specific finding or summaries of ongoing work in a laboratory, including unpublished results. What would you like to see? What would be useful? All comments are welcome, but certainly the most effective way to vote is by example.

The newsletter is in need of organizations, institutions, etc. to serve as PATRONS. It costs about \$350 per year for printing, mailing, and supplies. Any ideas?

The name of the CORRESPONDENT for each item in this newsletter is capitalized, so you know who to write to for reprints or whatever. The CORRESPONDENT'S ADDRESS appears at the END OF THE NEWSLETTER. Copies of the 1986 Directory of Cyanobacteriologists are still available for those in need.

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All cyanobacteriologists will be saddened to learn that CHASE VAN BAALEN passed away January 20 of this year. Chase was one of the real pioneers in the growth and physiology of several aspects of cyanobiology and his presence will be missed.

GENES FOR ATP-SYNTHASE AND A FERREDOXIN

J.E. WALKER and A.L. Cozens have cloned and determined DNA sequences of two gene clusters encoding subunits of ATP synthase in *Synechococcus* 6301. The proteins have been recognised by homology with bacterial, chloroplast and mitochondrial counterparts. One cluster is for the beta and epsilon subunits (c.f. chloroplasts); the other contains the remaining subunits arranged in the order a:c:b':b:beta:alpha:gamma, where a, c, b', and b are membrane (Fo) components, b' and b being related to each other in sequence. Upstream of the a subunit is a homologue of *E.coli* uncI, a membrane protein of unknown function.

As in the case of its chloroplast homologue, subunit I, b (and b') differ from the *E.coli* b protein in having an extension at their N-terminal ends. This has been shown to be processed off in the chloroplast [Bird et al. (1985) *EMBO J.* 4:1381-1386]. Perhaps this extension directs the protein in the correct orientation into the thylakoid membrane. The finding of two related but different genes for the b subunit suggests that the cyanobacterial ATP synthase will have nine subunits with one b and one b' per assembly (rather than two b subunits as found in *E.coli*). It also seems likely that the chloroplast enzyme will have a similar structure as suggested by the available data concerning its subunit composition.

The gene for the a subunit has been used to isolate a homologue from pea chloroplast DNA [Cozens et al., *EMBO J.* (1986) 5:217-222]. Next to this gene we found chloroplast homologues of *E.coli* ribosomal subunit S2 and the beta'-subunit of RNA polymerase [Cozens and Walker, *Biochem J.* (1986) 236:453-460]. They should be suitable probes for the cyanobacterial genes. Anyone interested?

The protein sequences and the gene orders are mostly closely related to those found in chloroplasts [Walker and Cozens (1986) *Chemical Scripta* 26:(in press)].

The ferredoxin gene [Cozens and Walker, *Biochem J.* (submitted)] is found immediately after the ATPase gamma-subunit, although it is probably separately transcribed. The predicted protein sequence is most closely related to the [2Fe-2S] ferredoxin from *Synechococcus lividans*. It has an unusual feature, a C-terminal extension of eight amino acids (although this could be processed off post-translationally). This extension is not related to the C-terminal extension found in Halobacteria. Twelve amino acids are invariant in all ferredoxins. Four are the cysteines providing ligands for the iron-sulphur cluster; the rest are also involved in forming its binding pocket. Two different ferredoxins have been shown to be present in some species of cyanobacteria. Southern blotting experiments with the ferredoxin gene did not reveal a homologue in *Synechococcus* 6301.

Five other unidentified potential genes (URFs) have been sequenced. They are not related to any protein in the PIR data base, nor is any apparently homologous to ferredoxin-NADP+ reductase, flavodoxin, PSI components, PSII subunits, cytochrome b/f complex, rubisco, phycobiliproteins, or *E.coli* nitrate reductase large subunit.

ECOPHYSIOLOGICAL RESEARCH ON RIVULARIA AND CALOTHRIX

ALLAN PENTECOST reports regarding a two-year study on the growth and calcification on four natural populations of *Rivularia*. The study demonstrates a significant correlation between growth and water temperature. When *Rivularia* ceased growth during winter, calcite deposits built up at the surface causing seasonal banding patterns. Resolution and recrystallisation also occur within the colonies. During the summer, surface calcification was slight but may continue to some extent deeper within the colonies.

A field-based study on the growth of *Calothrix*-dominated oncolites in a Yorkshire stream over a period of 20 months has shown that the banding patterns are seasonal in nature. The patterns were analysed and compared to those of nearby postglacial material. The results indicated that the postglacial samples formed under similar conditions but the variation in banding was sufficient to preclude their use as accurate palaeoenvironmental indicators. *Calothrix* growth was seasonal but an order of magnitude lower than *Rivularia*, with maximum summer rates of around 1 μm per day. Sheath mineralisation also differed markedly from that in *Rivularia*. This study will be published in the 5th Biomineralization Symposium Proceedings held at Arlington, University of Texas at Arlington, in 1986.

Other work in progress includes a study of the sheath pigments fuscurohodin and fuscoclorin in *Scytonema* and *Rivularia* and microautoradiography experiments of mucilage trails in motile *Oscillatorias*. A review of calcification in cyanobacteria by Pentecost and Riding will appear shortly in a Systematics Association special volume published by Oxford University Press.

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- N. TANDEAU DE MARSAC, D. Mazei, D.A. Bryant, and J. Houmard (1985). Molecular cloning and nucleotide sequence of a developmentally regulated gene from the cyanobacterium *Calothrix* PCC 7601: a gas vesicle protein gene. *Nucl. Acids Res.* 13:7223-7236.
- M. WYMAN, R.P.F. Gregory, and N.G. CARR (1985). Novel role for phycoerythrin in a marine cyanobacterium, *Synechococcus* strain DC2. *Science* 230:818-820.
- O.M. SKULBERG (1984). Directory to toxic cyanophyte literature from Norden. Norsk institutt for vannforskning, F-83462, Oslo.
- O.M. SKULBERG (1984). [Contamination and problems with mass development of bluegreen algae] [In Norwegian]. *Agricultural Contamination of Water Environment*, 20. Scandanavian Symposium on Water Resources, Haegersten. Nordforsk, Miljovardsserien, publ. 2, pp.183-194.
- O.M. SKULBERG, G.A. Codd, W.W. Carmichael (1984). Toxic blue-green algal blooms in Europe: a growing problem. *Ambio* 13:244-247.
- K. Berg and N.E. Soli (contact O.M. SKULBERG) (1985). Toxicity studies with the blue-green alga *Oscillatoria agardhii* from two eutrophic Norwegian lakes. *Acta vet. scand.* 26:363-373.
- K. Berg and N.E. Soli (contact O.M. SKULBERG) (1985). Effects of *Oscillatoria agardhii*-toxins on blood pressure and isolated organ preparations. *Acta vet. scand.* 26:374-384.
- O.M. SKULBERG and R. Skulberg (1985). Planktic species of *Oscillatoria* (Cyanophyceae) from Norway -- characterization and classification. *Arch. Hydrobiol. Suppl* 71(1/2):157-174.
- K. Berg, O.M. SKULBERG, R. Skulberg, B. Underdal, and T. Willen (1986). Observations of toxic blue-green algae (cyanobacteria) in some Scandinavian lakes. *Acta vet. scand.* (in press June).
- S. Prasatik-Cole and J.J. BRAND (1983). Genetic transfer of clumping phenotype in *Anacystis nidulans*. *Current Microbiol.* 8:141-146.
- D.W. Becker and J.J. BRAND (1985). *Anacystis nidulans* demonstrates a photosystem II cation requirement satisfied only by calcium or sodium. *Plant Physiol.* 79:552-558.
- P. Mohanty, J.J. BRAND, and D.C. Fork (1985). Calcium depletion alters energy transfer and prevents state changes in intact *Anacystis*. *Photosynthesis Res.* 6:349-361.
- F.R. TABITA and C.L. Small (1985). Expression and assembly of active cyanobacterial ribulose-1-5-bisphosphate carboxylase/oxygenase in *Escherichia coli* containing stoichiometric amounts of large and small subunits. *Proc. Natl. Acad. Sci. USA* 82:6100-6103.
- H. NAES, H. Aarnes, H.C. Utkilen, S. Nilsen, and O.M. Skulberg (1985). Effect of photon fluence rate and specific growth rate on geosmin production of the cyanobacterium *Oscillatoria brevis* (Kutz) *Gem. Appl. Environ. Microbiol.* June pp.1538-1540.

- I. Alpes, B. SCHRAUTEMEIER, S. Scherer, and P. Boeger (1985). Different enzymes involved in NADH- and NADPH-dependent respiration in the cyanobacterium *Anabaena variabilis*. *FEMS Microbiol. Lett.* 26:147-151.
- G.S. BULLERJAHN and L.A. Sherman (1986). Identification of a carotenoid-binding protein in the cytoplasmic membrane from the heterotrophic cyanobacterium *Synechocystis* sp. Strain PCC6714. *J. Bacteriol.* (July).
- Y.T. Wong, K.J. Moorhead, and E.O. DUERR (1985). Use of fresh cattle manures as a carbon source for production of *Spirulina platensis*. (Presented at ASM meeting.)
- W.I. Hugh, W. Dominy, and E. DUERR (1985). Evaluation of dehydrated *Spirulina* (*Spirulina platensis*) as a protein replacement in swine starter diets. Univ. Hawaii, Research Extension Series 056.
- S. Divakaran and E.O. DUERR (1986). Characteristics of a blue-green alga (*Spirulina platensis*) preserved by acidulation with sulfuric acid. Submitted to *Biotech. Bioeng.*
- S. Divakaran (contact E.O. DUERR) (1986). A pilot-scale process for the isolation of polyunsaturated fatty acids and carotenoids from *Spirulina platensis*. Submitted to *Biotech. Bioeng.*
- M. Wyman and P. FAY (1986). Underwater light climate and the growth and pigmentation of planktonic blue-green algae (cyanobacteria). I. The influence of light quantity. II. The influence of light quality. *Proc. Royal Soc. (London) B*, in press.
- M. Wyman and P. FAY (1986). Interaction between light quality and nitrogen availability in the differentiation of akinetes in the planktonic cyanobacterium *Gloeotrichia echinulata*. *Br. Phycol. J.*, in press.
- P. FAY and C. Van Baalen (eds.) (1986). *Cyanobacteria: Current research*. Elsevier, Amsterdam, in press.
- J.-C. Duval, J.-C. THOMAS, and Y. Choquet (1986). 77K fluorescence quenching induced by reduction of Photosystem I primary electron acceptors in a cyanobacterium. *Biochim. Biophys. Acta* 848:352-358.
- A. MITSUI, et al. (1985). Mass cultivation of algae and photosynthetic bacteria: concepts and application. In: *Biotechnology and Bioprocess Engineering* (T.K. Ghose, ed.). United India Press, New Delhi. pp. 119-155.
- S. KUMAZAWA and A. MITSUI (1985). Comparative amperometric study of uptake hydrogenase and hydrogen photoproduction activities between heterocystous cyanobacterium *Anabaena cylindrica* B629 and nonheterocystous cyanobacterium *Oscillatoria* sp. strain Miami BG7. *Appl. Environ. Microbiol.* 50:287-291.
- C. Leon, S. KUMAZAWA, and A. MITSUI (1986). Cyclic appearance of aerobic nitrogenase activity during synchronous growth of unicellular cyanobacteria. *Curr. Microbiol.* 13:149-153.
- E.J. Philips and A. MITSUI (1986). Characterization and optimization of hydrogen production by a salt water blue-green alga (cyanobacterium) *Oscillatoria* sp. Miami BG7. II. Use of immobilization for enhancement of hydrogen production. *Int. J. Hydrogen Energy* 11:83-89.
- S.-H. LI (1981). Studies on the nitrogen-fixing blue-green algae as biofertilizer in the late rice crop. *Acta Hydrobiol. Sinica* 7:417-423.
- S.-H. LI and Q.-L. Wang (1983). Nitrogen-fixing blue-green algae -- a source of biofertilizer. *Proc. of the Joint China-U.S. Phycology Symposium.* pp. 479-406.