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:

Netherlands	LUUC MUR
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Peoples' Republic of China	SHANG-HAO LI
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(See addresses on page 6 of newsletter)

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has consisted of brief reports concerning a specific finding or summaries of ongoing work in a laboratory, including unpublished results.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.

NICOLE TANDEAU DE MARSAC relates that she has written a review entitled "Advances in cyanobacterial molecular genetics" which will appear in a book called Cyanobacteria: Current Research (Eds. P. Fay and C. van Baalen; Elsevier Scientific Publications). The review will include, amongst other things, a table of all known cyanobacterial restriction enzymes, as well as a table that lists all the vectors she could uncover.

Tandeau de Marsac's table of restriction enzymes might prove very useful for those wishing to conjugate DNA into cyanobacteria, suggests JEFF ELHAI. He finds that the frequency of conjugation from E.coli to Anabaena 7120 increased dramatically (up to 1000-fold) by using as donor a strain that premethylates sites recognized by the Anabaena 7120 restriction enzyme AvaII. Perhaps this approach will work with other cyanobacteria, if the appropriate methylase gene is cloned or naturally found in E.coli.

OLAV SKULBERG has made available a directory to the literature on toxic cyanophytes. The directory covers articles from Scandanavian laboratories during the last 50 years.

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RELEASE OF VOLATILE COMPOUNDS LYTIC TO CYANOBACTERIA

S.J.L. WRIGHT is continuing his work in the microbial lysis of cyanobacteria, in particular following up his discovery that Bacillus spp. releases lytic volatile compound(s) [WRIGHT & Thompson, 1985, FEMS Microbiol. Lett. 30:263-267]. They have found that this phenomenon is not restricted to Bacillus spp. and is, in fact, widely spread amongst genera of aerobic heterotrophic bacteria. However, at present their studies on the mechanism of lysis and conditions affecting lytic activity are being made with Bacillus spp.. Light is an important factor in the expression of lysis, though initial damage may be light-independent.

EVOLUTION OF GAS VESICLES

A.E. WALSBY and coworkers at Bristol have recently shown that the mean cylinder width of gas vesicles in different cyanobacteria varies considerably from 107 nm down to 40 nm. The mean critical collapse pressure varies as an inverse function of the width, from 4 bar to over 30 bar, in keeping with theory for failure of engineering structures [P.K. HAYES & A.E. WALSBY, Br. Phycol. J., in press]. Their evidence supports the idea that in each species there has been natural selection for a variety of the gas vesicle protein (GVP) that assembles to form gas vesicles of the maximum width compatible with the pressure likely to be encountered by the organism. For example, in Dactylococcopsis from the Solar Lake the gas vesicles are wide (and therefore more efficient in providing buoyancy) and weak, but they encounter little hydrostatic pressure in the shallow pool, and little turgor pressure in the halophilic cells. Gas vesicles in Oscillatoria from a deep Norwegian lake, on the other hand, have to be narrower to provide the strength needed to withstand the greater pressures encountered. Andy Bleything and A.E.W. [unpublished] have demonstrated that there is a range in width of gas vesicles in a given species and that this accounts for part of the critical pressure distribution. Protein sequencing of GVPs from different organisms [WALKER, HAYES, & WALSBY (1984), J. Gen. Microbiol. 130:2709-2715; HAYES, WALSBY, & WALKER (1986), J. Biochem 236:31-36] shows that the degree of similarity of amino acid sequence is correlated with similarity in morphology and properties, and this supports the idea that the GVP amino acid sequence indirectly determines all the characteristics of a gas vesicle. They have obtained a clone containing the inducible gvp gene of Calothrix, from Nicole Tandeau de Marsac and her collaborators, that hybridises with restriction fragments of Anabaena DNA, but so far neither group has succeeded in cloning a gvp gene from a planktonic cyanobacterium that constitutively produces gas vesicles: it may be that the overproduction of GVP from its own promoter is lethal to the clone possessing it. Paul Hayes is therefore currently attempting to clone the gene from a gas-vesicle defective mutant of Anabaena.

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 fo 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-sulpher 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 um 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 fuscorhodin and fuscochlorin 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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