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July 1985

This issue inaugurates Cyanonews, intended to help connect the widely separated workers studying cyanobacteria. As a newsletter, Cyanonews may provide cyanobacteriologists with a forum for rapid, informal communication, unavailable through journals.

This first issue is many months later than I would have wished (My apologies if some request on the Billboard is no longer timely or some piece of news no longer news). In self defense I should institute a deadline for contributions, Nov. 1, 1985 for the next issue. Please send news, requests, publications, etc. by this date to the address below. If you are not in the directory, please also include your address, telephone, and brief description of research interests. Send (by Nov. 1) to:

Jeff Elhai
MSU/DOE Plant Research Laboratory
Michigan State University
East Lansing, MI 48824

It's still not clear to me how frequently the newsletter should be published and what features you'd like to see. A streamlined version might contain little more than publications and announcements of pertinent meetings. A more expansive version might include abstracts of work prior to publication, accounts of meetings, etc. Suggestions?

Several people have asked that meetings be announced soon enough in advance that they have a chance to go. I probably hear about no more meetings than you do, so please, if you know of a meeting that would be of interest to the body of cyanobacteriologists, send in the news.

A report on a workshop on cyanobacterial genes and gene transfer (Chicago, Sept. 1984) was published in Plant Molecular Biology Reporter (1985) 3:24-32. The reporter and workshop organizer was Robert Haselkorn, University of Chicago, 920 E. 58th Street, Chicago, Illinois 60637.

For most meetings, however, there is no way of learning what went on except by contact with a participant. There are several interesting meetings this summer, for example, the 6th International Symposium on Nitrogen Fixation (Aug 4-10, Corvallis, Ore., USA), Workshop on Bioenergetics of Blue-Green Algae (Sep 16-21, Chios Island, Greece), and the 5th International Symposium on Photosynthetic Prokaryotes (Sep 22-28, Grundelwald, Switzerland). If you are attending a meeting of interest to the cyanobacterial world, please feel free to send in your comments for the newsletter. I will combine reports if we are so fortunate to have more than one contributor.

Several people suggested a subscription fee to defray mailing and printing costs. I can tell you that this issue has cost about $0.75 per North American participant and $1.50 for each participant outside. A cost per year depends on the size and frequency of future issues, which in turn depends on you. In any event, contributions will be cheerfully accepted, checks made payable to CYANONEWS - MSU.

*BILLBOARD*BILLBOARD*BILLBOARD*BILLBOARD*BILLBOARD*BILLBOARD*BILLBOARD*

Y.J. Avissar wants to know what is the best way to obtain *in vitro* nitrate reductase activity from filamentous cyanobacteria (preferably *Anabaena*).

S. Douglas would like to hear any news of recent isolations of small (2 um) marine unicellular cyanobacteria.

J. Thomas proposes that there be an exchange (on request) amongst Newsletter contributers preprints of papers accepted for publication. [That leaves the problem of how potential requesters hear about the existence of preprints. In answer...] P. Boger suggests that abstracts of papers should be published in the newsletter prior to publication, immediately after submission.

M. Potts would like some antibody to glutamine synthetase (from *Nostoc* preferably or any *Anabaena*). Anyone have one?

R. Simon is writing a review on cyanobacterial inclusion bodies -- cyanophycin, polyphosphate, and carboxysomes. He would appreciate any reprints of recently published papers and preprints of work in progress.

F.R. Tabita wonders if there could be compiled a list of strains and their properties in each laboratory. [This sounds as if it could turn into a multivolume work! Before asking people to send in lists, perhaps I should ask for some feedback: do you want such a compilation? Exhaustive? Only selected (i.e. interesting) strains?]

N. Tandeau de Marsac would appreciate any information about new cloning vectors (availability, maps, etc.) and about plasmids or restriction endonucleases in strains newly checked. She also notes that the establishment of a general nomenclature for plasmids or cloning vectors would be of great help. [any suggestions?]

T. Thiel suggests that if you have a strain in search of a shuttle vector (for cloning), she would be more than happy to test in it the viability of her broad host-range plasmid, pRL153 (see NEWS, below).

R. Tuli points out that it's difficult to learn of negative results, for example, on topics such as protoplast formation, cell lysis, restriction digestion of DNA, and the cryptic nature of plasmids.

R. Tuli asks if anyone can supply an estimate on the contribution of cyanobacteria to global nitrogen fixation and to cultivated soil. R.T. also raises the point that an updated nomenclature and classification of cyanobacteria would be desirable, indicating variability in the occurance of diazotrophy.

A. Vonshak is interested in obtaining *Spirulina* strains collected from nature.

Several people would like to learn about proven methods for long term storage and transportation of cyanobacteria.

!NEWS!!NEWS!!NEWS!!NEWS!!NEWS!!NEWS!!NEWS!!NEWS!!NEWS!!NEWS!!NEWS!!NEWS!

K. Izui and H. Katsuki report that they have cloned the *ppc* gene (phosphoenolpyruvate carboxylase) from E. *coli* and A. *nidulans* and determined their nucleotide sequences. They are now attempting to return the A. *nidulans* gene by means of a shuttle vector that can replicate in both E. *coli* and A. *nidulans*. They are also interested in the preparation of cDNA clones of the *ppc* genes from eucaryotic organisms.

T. Thiel has found conditions under which glutamine satisfies the nitrogen requirement of *Anabaena variabilis* Nif12 but has no effect on heterocyst formation, that is, glutamine gets into the cell but does not repress heterocyst formation. She has performed experiments to exclude the possibility that ammonia produced from the spontaneous breakdown of glutamine is responsible for the effect.

Field experiments performed by J. Thomas and Tonina Fernandes using radioactive dinitrogen indicate that in a low nitrogen (0.07% N) soil, *Nostoc*-4 inoculation promotes nitrogen fixation amounting to 39 Kg N/ha during a rice cropping season (120 days), whereas in a high nitrogen soil (0.22% N), the quantity is only about 7 Kg N/ha.

P. Wolk, J. Elhai, T. Thiel, and Nancy Cross report that pRL153, based on the broad host-range vector RSF1010 is able to maintain itself at least in *Anabaena* M-131, *Anabaena* PCC7118, and *Anacystis nidulans* R2. pRL153 carries kanamycin/neomycin resistance and has 2 AvaI and 1 AvaII sites.

*ABSTRACTS*ABSTRACTS*ABSTRACTS*ABSTRACTS*ABSTRACTS*ABASTRACTS*ABSTRACTS*

Sodium requirement and metabolism in nitrogen-fixing cyanobacteria

Joseph Thomas and Shree Kumar Apte

(Accepted by J. Biosci.)

Sodium affects the metabolism of eukaryotes and prokaryotes in several ways. This review collates information on the effects of Na$^+$ on the metabolism of cyanobacteria with emphasis on the N_2-fixing filamentous species. Na$^+$ is required for nitrogenase activity in *Anabaena torulosa*, *Anabaena* L-31, and *Plectonema boryanum*. The features of this requirement have been mainly studied in *Anabaena torulosa*. The need for Na$^+$ is specific and cannot be replaced by K$^+$, Li$^+$, Ca^{2+}, or Mg^{2+}. Processes crucial for expression nitrogenase such as molybdenum uptake, protection of the enzyme from oxygen inactivation and conformational activation of the enzyme are not affected by Na$^+$. Mo-Fe protein and Fe protein, the two components of nitrogenase are synthesized in the absence of Na$^+$ but the enzyme complex is catalytically inactive. Photoevolution of O_2 and CO_2 fixation, which are severely inhibited in the absence of Na$^+$, are quickly restored by NH$_4^+$, glutamine, or glutamate, indicating that Na$^+$ deprivation affects photosynthesis indirectly due to deficiency in the products of N_2 fixation. Na$^+$ deprivation decreases phosphate uptake, nucleoside phosphate pool, and nitrogenase activity. These effects are reversed by the addition of Na$^+$

suggesting that a limitation of available ATP caused by reduced phosphate uptake results in loss of nitrogenase activity during Na^+ starvation.

Na^+ influx in *Anabaena toculosa* and *Anabaena* L-31 is unaffected by low K^+ concentration, is carrier mediated, follows Michaelis-Menten kinetics, and is modulated mainly by membrane potential. Treatments that cause membrane depolarization and hyperpoilarization inhibit and enhance Na^+ influx respectively. These cyanobacteria exhibit rapid active efflux of Na^+, in a manner different from the Na^+/H^+ antiporter mechanism found in *Anacystis nidulans*.

Na^+ requirement in nitrogen metabolism including nitrate assimilation, synthesis of amino acids and proteins, in respiration and oxidative phosphorylation, in transport of sugars and amino acids, cellular distribution of absorbed sodium, physiological basis of salt tolerance and prospects of reclamation of saline soils by cyanobacteria are the other aspects discussed in this review.

*PUBLICATIONS*PUBLICATIONS*PUBLICATIONS*PUBLICATIONS*PUBLICATIONS*PUBLIC

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[1] Reprints available from: Huey-Ing Liu
Taiwan Agricultural Research
Institute, 189 Chung-Cheng Road
Wan-Feng, Wu-Feng
Taichung, Taiwan, Republic of China

DIRECTORY OF CYANOBACTERIOLOGISTS
(July 1985)

Almon, Helmar	Lehrstuhl für Physiologie und Biochemie der Pflanzen Universität Konstanz, D-7750 Konstanz, GERMANY (Tel) 07531/883669	Nitrogenase, Hydrogenase Photosynthesis, Biosolar energy conversion, Storage compounds, Trace elements
Apte, Shree Kumar	Biology & Agriculture Div. Bhabha Atomic Research Centre Trombay, Bombay 400 085 INDIA (Tel) 5514910 Ext. 2340	Nitrogen fixation -- physiology, genetics, biochemistry Ion transport Salt tolerance
Avissar, Yael J.	Dept. Biology Ben Gurion University P.O. Box 653 Beer Sheva 84105, ISRAEL (Tel) 57/661363	Nitrogen metabolism Nitrogen assimilation Chlorophyll biosynthesis
Binder, Andres	Institute of Plant Biology University of Zurich Zollikerstr. 107 CU-8008 Zurich, SWITZERLAND (Tel) 01-47 32 74	Structure and function of energy transducing membranes
Böger, Peter	Lehrstuhl für Physiologie und Biochemie der Pflanzen Universität Konstanz D-7750 Konstanz, GERMANY (Tel) 07531/882101	Respiration/photosynthesis Nitrogen Fixation Light-induced hydrogen evolution
Bothe, Hermann	Botanical Institute University of Cologne Gyrhofstr. 15 D-500 Koeln 41, FRG (Tel) 0221 470 2760	Metabolism and genetics
Boussiba, Samy	Jacob Blaustein Institute for Desert Research Sede Boger Campus 84990 ISRAEL (Tel) 612/57-353333	Ammonia translocation
Cannon, Robert E.	Dept. of Biology UNC-Greensboro Greensboro, NC 27412 USA (Tel) 919/379-5888	Cyanophages Pesticide effect on cyanophages and cyanobacteria
Carr, N.G.	Dept. of Biological Science University of Warwich Coventry, UK	Gene-transfer into and out of cyanobacteria

Castenholz, Richard	Biology Dept. University of Oregon Eugene, OR 97403 USA (Tel) 503/686-4530	Ecology/physiology Ecology of hot springs Sulfide effect on cyanobacteria
Chaplin, Alan E.	Dept. of Biochemistry University College of Swansea SA28PP UK (Tel) 0792 295375	Nitrogen Fixation
Ciferri, Orio	Dept. of Genetics & Microbiol. Via S. Epifanio 14 - 27100 Pavia ITALY (Tel) 0382 31613	Biochemistry and molecular biology of Spirulina
Conley, Pamela B.	Dept. of Plant Biology Carnegie Inst. of Washington 290 Panama St. Stanford, DA 94305 USA (Tel) 512/325-1521	Phycobilisome polypeptide genes from chromatically-adapting cyanobacteria,
Curtis, Stephanie	Dept. of Genetics Box 7614, NCSU Raleigh, NC 27695-7614 USA (Tel) 919/737-2294	Photosynthesis genes Heterocyst differentiation
Douglas, Susan	Biochemistry Department Dalhousie University Halifax, Nova Scotia B3H 4H7 CANADA (Tel) 902/424-3569	Molecular evolution Marine Cyanobacteria
DzelzKalns, Valdis	16 Divinity Ave. Harvard University Cambridge, MA 02138 USA (Tel) 617/495-4260	Regulation of gene expression
Elhai, Jeff	MSU/DOE Plant Research Lab Michigan State University East Lansing, MI 48824 USA (Tel) 517/353-6641	Genetics of heterocyst differentiation
Ernst, Anneliese	Lehrstuhl für Physiologie und Biochemie der Pflanzen Universität Konstanz D-7750 Konstanz, GERMANY (Tel) 07531/882908	Nitrogenase, hydrogenase Photosynthesis, biosolar energy conversion Storage compounds Trace elements
Fogg, G.E.	Marine Science Laboratories Menai Bridge, Anglesey, Gwynedd LL59 5EH UK (Tel) 0248/712 641	Planktonic cyanobacteria
Gallon, John	Dept. of Biochemistry University College Swansea, UK (Tel) 0792/295376	Nitrogen fixation Non-heterocystous cyanobacteria

Gromov, Boris V.	Biological Institute of Leningrad University Oranienbaumskoye sch.2 Stary Peterhof Leningrad 198904 USSR (Tel) 257-97-40	Ultrastructure Biology of cyanobacteria and cyanophages
Grossman, Arthur	Carnegie Institution of Washington 290 Panama St. Stanford, CA 94305 USA (Tel) 415/325-1521	Phycobilisome biosynthesis Regulation of phycobilisome genes Adaptation of cyanobacteria to stress
Hostos, Eugenio de	Carnegie Institution Department of Plant Biology 290 Panama St. Stanford, CA 94305 USA (Tel) 415/325-1521	Adaptation to sulfer starvation in blue-greens and Chlamydomonas
Houghton, James	Dept. of Microbiology University College Galway, IRELAND (Tel) 091/24411 ext. 250	Genetics and genetic engineering
Huang, Tan-Chi	Institute of Botony Academia Sinica Nankang, Taipei Taiwan REPUBLIC OF CHINA	Physiology Taxonomy
Izui, Katsura	Dept. of Chemistry Faculty of Science Kyoto University Kyoto 606 JAPAN (Tel) 075-751-2111 ext. 3996	Phosphoenolpyruvate carboxylase gene structure and regulation
Jüttner, F.	Inst. Chem. Pflanzenphysiol. Corrensstr. 41 D-74 Tübingen, WEST GERMANY	Volatile compounds Secondary metabolites Chemotaxonomy
Kallas, Toivo	Div. of Molecular Plant Biol. Hilgard Hall, Univ. California Berkeley, CA 94720 USA (Tel) 415/642-5959	Physiology, cell diff'n molecular biology Nitrogen fixation, photosynthesis
Katsuki, Hirohiko	Dept. of Chemistry Faculty of Science Kyoto University Kyoto 606 JAPAN (Tel) 075-751-2111 ext. 3995	Enhancement of photosynthetic CO2 fixation Phosphoenolpyruvate carboxylase
Krogmann, David W.	Dept. of Biochemistry Purdue University W. Lafayette, IN 47907 USA (Tel) 317/494-1641	Photosynthesis Structure of protein catalysts Evolution

Laudenbach, Dave	Univ. of Toronto Dept. of Botony Toronto, Ontario CANADA M5S 1A1 (Tel) 416/978-5563	Plasmid replication and function
Lemaux, Peggy G.	Dept. of Plant Biology Carnegie Inst. of Washington Stanford, CA 94305 USA (Tel) 415/325-1521	Photosynthesis Nitrogen fixation Genetics
Li, Shanghao	Laboratory of Phycology Institute of Hydrobiology Academia Sinica, Wuhan PEOPLE'S REPUBLIC OF CHINA	Nitrogen fixation
Lin, C.J.	Dept. of Agricultural Chemistry Taiwan Agricultural Research Institute Wufeng, Taichung Taiwan, REPUBLIC OF CHINA	Azolla/Anabaena
McFadden, Bruce	4660 - Biochemistry Washington State University Pullman, WA 99164 USA (Tel) 509/335-4937	Autotrophy Catalysis by RBCase/ oxygenase Transformation
Merchant, Sabeeha	16 Divinity Avenue Harvard University Cambridge, MA 02138 USA (Tel) 617/495-4260	Expression of photosynthesis genes in A. nidulans and Chlamydomonas
Murry, Marcia	MSU/DOE Plant Research Lab Michigan State University East Lansing, MI 48823 USA (Tel) 517/353-2049	Nitrogen fixation -- physiology, molecular biology Heterocyst development
Packer, Lester	Dept. of Physiology/Anatomy 2544 Life Sciences Bldg. University of California Berkeley, CA 94720 USA (Tel) 415/642-1872	Bioenergetics
Pakrasi, Himadri	Experimental Stn./E402-2107 DuPont de Nemours & Co. Wilmington, DE 19898 USA (Tel) 302/772-2610	Photosynthesis Membrane organization Genetics of unicellular cyanobacteria
Potts, Malcolm	Cyanobacterial Research Group Biological Science Florida State University Tallahassee, FL 32306 USA	Gene expression in cyanobacteria undergoing water stress and dessication
Scherer, Siegfried	Lehrstuhl für Physiologie und Biochemie der Pflanzen Universität Konstanz D-7750 Konstanz, GERMANY (Tel) 07531/883669	Photosynth./respiration Oxidative phosphorylation Cytochrome oxidase NAD(P)H-dehydrogenase Systematics

Sherman, Louis	University of Missouri Division of Biological Sci. Tucker Hall Columbia, MO 65211 USA (Tel) 314/882-7727	Photosynthesis Membrane structure Genetics and molecular biology Unicellular cyanobacteria
Shinozaki, Kazuo	Department of Biology Faculty of Science Nagoya University Furo-cho, Chikusa Nagoya 464 JAPAN (Tel) 052/781-5111 ext. 2495	Gene organization of photosynthetic apparatus Transformation Endosymbiosis
Simon, Robert D.	Department of Biology SUNY- Geneseo Geneseo, NY 14454 USA (Tel) 716/245-5301	Genetics Development Cell inclusions
Singh, P.K.	Laboratory of Blue-green Algae Central Rice Research Inst. Cuttack-753 006, Orissa INDIA (Tel) PBX 20020 Ext. 4	Nitrogen fixation Physiology Ecology and biofertilization to rice crop
Stevens, Edward S.	101 S. Frear Dept. of Molec. & Cell Biol. Pennsylvania State University University Park, PA 16802 USA (Tel) 814/865-1294	Metabolic regulation in prokaryotes Nitrogen metabolism Pigment biosynthesis Photosynthesis
Sugiura, Masahiro	Center for Gene Research Nagoya University Chikusa, Nagoya 464 JAPAN	Structure and expression of rRNA, tRNA and ribosomal protein genes
Sutton, Ann	Dept. Biology Brookhaven National Laboratory Upton, NY 11973 USA (Tel) 516/282-3382	Regulation of genes of photosystem II in vegetative cells and heterocysts of Anabaena
Szalay, Aladar A.	Cornell University Boyce Thompson Institute Tower Rd. Ithaca, NY 14853 USA (Tel) 807/257-2030 ext.315	Homologous recombination Heterologous gene expression Site-directed alteration of polypeptides
Tabita, F. Robert	Dept. Microbiology & Center for Applied Microbiology University of Texas at Austin Austin, TX 78712 USA (Tel) 512/471-3512	Nitrogen fixation and metabolism Carbon dioxide fixation
Tandeau de Marsac, Nicole	Physiologie Microbienne Institut Pasteur 28 rue du Dr. Roux 75724 Paris Cedex 15 FRANCE (Tel) 567-46-98	Molecular organization, function of light-regulated genes Plasmids and restriction endonucleases

Tel-Or, Elisha	Agric. Botony Hebrew University Rehovot 76100 ISRAEL (Tel) 08/481262	Salt tolerance,adapt'ion Anabaena/Azolla Heterotrophic metabolism Peroxide removal
Thiel, Teresa	Biology Dept. University of Missouri St. Louis, MO 63121 (Tel) 314/553-6208	Genetics Cyanophage Regulation of heterocyst and akinete development
Thomas, Joseph	Biology and Agriculture Div. Modular Labs Bhabha Atomic Research Centre Trombay, Bombay 400 085 INDIA (Tel) 5514910 ext. 2340	Biochemical genetics Physiology Field application of cyanobacteria
Tiboni, Orsola	Dept. of Genetics & Microbiol. Via S. Epifanio 14 - 27100 Pavia, ITALY (Tel) 0382/31613	Biochemistry Molecular genetics Spirulina
Tuli, Rakesh	Biology and Agriculture Div. Modular Labs. Bhabha Atomic Research Centre Trombay, Bombay - 400 085 INDIA	Genetics, physiology, ecology Nitrogen fixation
Vonshak, Avigad	Jacob Blaustein Institute for Desert Research Sede Boqer Campus 84990 ISRAEL (Tel) 057/35333 ext. 76	Algal physiology Environmental factors on algal growth Osmotic stress and light intensity on Spirulina
Walsby, A.E.	Dept. of Botany University of Bristol Bristol BS8 1UG, ENGLAND	Gas vesicles Planktonic cyanobacteria Gliding movement Heterocysts
Wasmann, Cathy C.	Dept. of Biochemistry Rm. 528 Bio Science West University of Arizona Tucson, AZ 85721 USA (Tel) 602/621-7982	*Cyanophora paradoxica* Molecular Biology of cyanobacteria Protein transport into eukaryotic organelles
Whitton, B.A.	Dept. of Botany University of Durham Durham, DH1 3LE, ENGLAND	Nitrogen fixation, rice Heavy metal accumulation Biology of Rivulariaceae
Wolk, C.P.	MSU-DOE Plant Research Lab. Michigan State University East Lansing, MI 48824 USA (Tel) 517/353-2049	Development, physiology, and genetics
Wood, Nancy	Dept. of Biology Roosevelt University 430 S. Michigan Ave. Chicago, IL 60605 USA (Tel) 312/341-3682	Cyanophages Transformation and transduction Proteolysis Amino acid utilization