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Lund University

Section of Plant Cell Biology, 1992-93

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Postdoctoral Fellow (NFR): **Dalibor Stys**, PhD (Prague)
Postdoctoral Fellow (Schyberg Foundation): **Krassimir Alexciev**, PhD
(Sofia).

Secretary: **Ilga Liljenberg**, BA (Stockholm)

Guest Researcher: **Sylvain Dubé**, PhD (Simon Fraser) Nov.92-June.93
Guest Researcher (European Molecular Biology Organisation short-term fellow):
Colin Robinson, PhD (Warwick) Oct 1992-Jan 1993
Guest Researcher (Fulbright Scholarship):
Todd Silverstein, PhD (Berkeley) May-July 1993

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Introduction

Plant Cell Biology began life in May 1992, and became a distinct section of the Lund University Mathematics and Natural Sciences Faculty on 1st July 1992. Plant Cell Biology has now grown to a fully functional research and teaching unit with its own staff and record of achievement. The purpose of this first report is to provide a description of our activities and achievements as they stand at the end of 1993.

The general goals of the section of Plant Cell Biology are to advance understanding of how cells control their use of energy in photosynthesis and respiration, of how protein structure may be modified as part of this control, and of how (and why) the genes that encode the proteins of photosynthesis and respiration might be switched on or off. We work with plant cells, chloroplasts and mitochondria, photosynthetic bacteria, and with isolated proteins and membrane systems.

All eukaryotic cells contain at least three distinct, membrane-bound compartments; the nucleus, the cytosol, and the mitochondrion. The plant cell has a fourth; the chloroplast. The primary function of the chloroplast is photosynthesis. This is the process that converts sunlight into chemical energy, and upon which all life ultimately depends. Plants are rooted to the spot, since their "food" - light - comes to them. When the environment changes, the plant cannot move away. Plants therefore show great flexibility in the way their cells adapt to changing environments.

The chloroplast, like the mitochondrion, evolved from a bacterium, and has retained a small outpost of genes, perhaps to encode those of its protein components which are especially dangerous if made in the wrong environment. Thus the plant cell is nature's most complex genetic system, with three distinct sets of genes: in the nucleus, the mitochondrion, and the chloroplast. It is therefore an ideal subject to test general ideas about the control and coordination of gene function during adaptation to environmental change.

Lund University is already well-known internationally for excellence in research on plant cell and chloroplast membranes, particularly that carried out by members of Biochemistry and Plant Biochemistry. The Professorship in Plant Cell Biology was established by the Faculty on the retirement of Professor Anders Kylin. The intention seems to have been to bring plant molecular cell biology to Lund, providing a bridge between (Plant) Biochemistry and Plant Physiology, with molecular biology in the foreground, as in all areas of modern biology. Thus Plant

Cell Biology has a unique opportunity to work together with the many excellent sections representing complementary interests and subject areas. As a hybrid subject it is essential that Plant Cell Biology should look outwards in this way, using the plant cell as a highly detailed model to address problems of general biological concern.

I became Lund University's first Professor of Plant Cell Biology on 1st May 1992. Already the section has grown, as it should, to be much more than one man's interest and activity. It has been a pleasure to welcome Dr Carin Jarl, with her independent research council (SJFR) fellowship for work on plant cell culture and transformation. Dr Gunilla Håkansson was appointed to the first university research assistantship, and brings an outstanding background in plant mitochondrial function and gene expression. It is a pleasure to report that both these early recruits now have independent research council support. The overseas postdocs, Dr Dalibor Stys (NFR) and Dr Krassimir Alexciev (Schyberg Foundation), have outstanding abilities in protein structure and molecular genetics. The doctoral students, Carol Allen, Lüling Cheng, André Struglics, and, most recently, Anna Tullberg, are active and committed students who have made excellent progress in this new and untried environment. We have had three temporary visitors, Dr Sylvain Dubé, Dr Colin Robinson (an EMBO short-term fellow) and Dr Todd Silverstein (a Fulbright scholar), who have helped us focus on different experiments and techniques. We have a patient and conscientious secretary in Ilga Liljenberg. We have also received support from technical staff and scientific colleagues in the Plant Biology building and elsewhere in the university, particularly during the modernisation of our laboratories and offices. It is a pleasure that Anders Kylin has agreed to become formally affiliated as our Professor Emeritus; he has brought a shrewd and supportive contribution to our weekly seminars and discussion groups. The invisible, scientific walls around departments and sections seem to be particularly low in Lund. We have quickly found willing collaborators, especially in Biochemistry and Physical Chemistry 2, and other welcome links are being forged.

By some extra good fortune, the individual members of Plant Cell Biology seem to share some similarities in outlook, both scientific and personal. The scientific part has become apparent in research, in seminars, in the Photosynthesis graduate course, and in planning for the forthcoming course Molecular Cell Biology. This outlook could be described as an inclination to look outwards for challenge and opportunity, rather than to build protective walls. There is a personal delight, too, in day-to-day interactions with bright and motivated people from different backgrounds and cultures. For the first time, I personally

find myself working with colleagues whose own lives and careers are developing together in the most natural way, which is a way of saying “welcome” also to Simon (1 year), Dalibor Caspar (6 months) and Carl Magnus (4 months), all first children, and born within the marginally longer but equally promising lifetime of Plant Cell Biology (18 months). Victor (16 months), like a few of the publications, is strictly speaking a previous achievement, but no less welcome for that.

May all their, and our, fortunes increase.

Excellence is on the agenda!

John Allen
Lund, January 10, 1994

Overview of areas of research

Cellular Level.

(Prof. John Allen, Dr Gunilla Håkansson. Miss Anna Tullberg, Mrs. Lüling Cheng, Mrs Carol Allen, Mr André Struglics).

Control of structure, function and synthesis of light-harvesting proteins by photosynthetic electron transport. This control is studied at both post-translational and transcriptional levels of gene expression. This research may lead to an understanding of how cells are able to respond to fluctuating environmental conditions, adapting to stress that would otherwise limit growth and productivity. At the post-translational level, we have recently resolved up to seventeen chloroplast proteins whose phosphorylation is controlled by redox potential, and find parallel control mechanisms in cyanobacteria, purple photosynthetic bacteria, and mitochondria. Chloroplasts and mitochondria are descendants of bacteria, from which they retain genes for a small but constant sub-set of their own components. We suspect that they may also have inherited bacterial control systems to regulate these genes. This hypothesis is currently being tested. Initial results show that both protein phosphorylation and the products of protein synthesis depend upon the redox potential of the medium in which isolated chloroplasts and mitochondria are suspended. Supported by NFR, the Swedish Natural Science Research Council (to JFA), and SJFR, the Swedish Agriculture and Forestry Research Council (to GH).

Molecular and Structural Level: Protein Engineering.

(Prof. John Allen, Dr Dalibor Stys, Dr Krassimir Alexciev).

The structural changes of light-harvesting pigment-protein complexes when they undergo natural chemical modification (phosphorylation) within the living cell are sought by a combination of high-resolution structural studies and directed mutation to alter specific structural features such as sites of modification. Reaction centres and their interactions with light-harvesting systems are also modified by phosphorylation. This research may lead to an increased general understanding of control of protein-protein interactions in energy- and signal-transduction in biology. Supported by the EC Science Plan (collaborating with groups in Germany and UK) and Schyberg Stiftelsen (to JFA)

Co-ordination of levels of adaptation.

(Prof. John Allen).

A new technology of *time-resolved imaging spectroscopy* is applied to the study of cellular responses to stress on different time scales and at

different levels of gene expression. The natural fluorescence of chlorophyll in photosynthetic systems is used as a non-invasive probe, by rapid computer acquisition of digitized images of fluorescence. Variations in fluorescence can then be measured simultaneously in a large population of cells. Thus subtle, adaptive responses can be used for the first time as genetic markers in screening for mutation. This technique will be applied in all of the research areas described here. Supported by FRN, the Research Council Equipment Fund.

In vitro culture and transformations.

(Dr Carin Jarl-Sunesson).

Methods are developed and established for plant regeneration from cells and tissues, and for isolation and fusion of protoplasts - cells without walls. Fusion of protoplasts allows transfer of inherited characters between plant species that cannot naturally interbreed. One application is transfer of disease resistance from their wild relatives to cultivated crop plants. Individual genes can be introduced into plant cells by a number of techniques, especially using barley and the small crucifer (a cress relative) *Arabidopsis thaliana*. Using cell fusion and gene transfer, new possibilities are created for fundamental studies of gene regulation and recombination. Supported by SJFR, the Swedish Agriculture and Forestry Research Council (to CJ-S).

Research grants and awards

- Commission of the European Communities, Science Plan. *Protein engineering of the chloroplast light-harvesting complex of photosystem II*. Coordinator: J F Allen, Lund. Co-applicants: W Kühlbrandt (European Molecular Biology Laboratory, Heidelberg), A C Cuming (Department of Genetics, University of Leeds, U.K.) ECU 250 000 over three years from 01.10.92, of which ECU 55 407 to Lund over two years from mid-1993.
- Swedish Natural Science Research Council (NFR). Research Grant to J F Allen. *Membrane phosphoproteins regulating prokaryote photosynthesis: sequence, structure and regulatory function*. SEK 375 000 for one year from 15 November 1992. Appointed: Dr Dalibor Stys.
- Swedish Natural Science Research Council (NFR). Research Grant to J F Allen. *Membrane phosphoproteins regulating prokaryote photosynthesis: sequence, structure and regulatory function*. SEK 900 000 (of which 400 000 for equipment) over 2 years from 1 January 1994, plus a second year of support (SEK 210 000) for the Dr Stys.
- Swedish Council for Planning and Coordination of Research (FRN). Equipment grant to J F Allen (co-applicants: H-E Åkerlund, Biochemistry, and P-Å Albertsson, Biochemistry). *Nanosecond laser photolysis spectrometer and fluorescence imaging spectrometer*. SEK 1 722 000 from September 1992
- Per-Eric och Ulla Schybergs Stiftelse. *Molecular recognition and control of protein structure during regulation of photosynthesis*. Award to J F Allen. SEK 365 000 for equipment, visiting scientists and a postdoctoral assistant. 1993. Appointed: Dr Krassimir Alexciev.
- Swedish Agriculture and Forestry Research Council (SJFR). Research Grant to Gunilla Håkansson. *Redoxreglering av genexpression i kloroplaster och mitokondrier hos högre växter*. SEK 272 000 over two years from 1993-95.
- Swedish Agriculture and Forestry Research Council (SJFR). *In vitro odling av korn (Hordeum vulgare L.)*. Award to Carin Jarl. Three years from 1992, including forskarassistent position.
- Kungliga Fysiografiska Sällskapet i Lund; Fonder för Naturvetenskap och Medicin *Bakteriella tvåkomponent-system i*

regleringen av organellgenomens transkription. Co-applicants: Carin Jarl-Sunesson and Gunilla Håkansson. SEK 75 000 December 1992.

- Kungliga fysiografiska sällskapet i Lund. 1993. *Phosphoproteins in photosynthesis: psbH gene products in cyanobacteria.* Award to Krassimir Alexciev. SEK 55 000 over 1 year.
- Kungliga Fysiografiska Sällskapet i Lund. Nilsson-Ehle fonden Award to Gunilla Håkansson. *Bakteriella tvåkomponent-system i regleringen av organellgenomens transkription.* December 1992. SEK 55 000.
- Kungliga Fysiografiska Sällskapet Lund. Award to Dalibor Stys. SEK 41 000. 1993.
- Kungliga fysiografiska sällskapet i Lund. *Research work in Basel Biocentre, Basel, Switzerland.* Travel award to André Struglics. SEK 20 000. 30 November 1992 - 1 April 1993.
- Knut och Alice Wallenbergs Stiftelse. Travel award to Lüling Cheng. *2nd Nordic Photosynthesis Congress.* SEK 5 000. Fall 1993.
- Karolinska Institut Fonden - 1992. *Stability elements in BR specific pre-mRNP particles.* Award to Krassimir Alexciev. SEK 15 000 over 1 year.
- Karolinska Institut Fonden - 1993. *Stability elements in BR specific pre-mRNP particles.* Award to Krassimir Alexciev. SEK 23 000 over 1 year.
- Czechoslovak Academy of Science. Award to Milos Budesinsky, Petr Strop, Dalibor Stys, Jan Pelnar and Helena Pelantova. Ckr 127 000. 1992.
- FEBS short-term fellowship. DM 2 400 awarded to Dalibor Stys. 1992.
- Travel fellowship of XV International Conference of Magnetic Resonance in Biological Systems. Dalibor Stys, 1992.
- Erik-Philip Sörensens stiftelse: *In vitro odling av korn (Hordeum vulgare L.)* Award to Carin Jarl. SEK 20 000. 1993.

- Lunds stads jubileumsfond. Travel award to André Struglics. *2nd Nordic Photosynthesis Congress*. SEK 5 000. 4-6 November 1993
- NorFA: nordiskt nätverk *Växelverkan mellan mikroorganismer och växter i nordlig miljö*. Award to Carin Jarl.
- Stiftelsen Lars Hiertas Minne. Award to Gunilla Håkansson. *Bakteriella två-komponent system i regleringen av organellgener*. November. 1993 SEK 15 000

External seminars and contributions to scientific meetings

1992

29 June. University of Amsterdam, The Netherlands. Laboratory of Microbiology. Seminar "*Redox control of protein phosphorylation in photosynthesis: structural effects and implications for the evolution of organelle genomes*" (JFA).

August. NATO Advanced Study Institute "Post-transcriptional regulation of gene expression" Spetsai, Greece. Poster presentation. (KA).

16-21 August. XV International Conference on Magnetic Resonance in Biological Systems, Jerusalem, Israel. Poster presentation (DS plus six other authors) "*Structure Mapping of Immunodeterminant regions of transmembrane domain of gp 41 protein from HIV-1 virus. Structure determination of different immunoresponse behaviour*".

27-30 August. International Symposium on Molecular Structure and Regulation of Photosynthetic Pigment Systems, Sanda Conference Center, Osaka, Japan. Oral presentation "*Protein structural implication of LHC II phosphorylation*" (JFA).

30 August - 4 September. XIth International Congress on Photosynthesis, Nagoya, Japan. Invited discussion leader in session on "Light Acclimation". Three poster presentations: "*Molecular structural effects of protein phosphorylation in regulation of photosynthesis*"; "*Partial purification of the 15 kDa phosphoprotein of Synechococcus 6301*"; "*A photodamage process which is distinguishable from photoinactivation is characterized as inactivation of multiple sites*" (JFA).

5-7 September. Meeting on Evolution of Photosynthetic Systems. National Institute for Basic Biology, Okazaki, Japan. Poster and oral presentation "*Redox control of gene expression in chloroplast evolution*" (JFA).

15-20 September. DFG-Workshop "Interactions of Three Genomes", Berlin. Oral presentation: Håkansson G, Kofler W, Glimelius K. "*Mitochondrial changes as an effect of nuclear or mitochondrial restoration of CMS in Nicotiana*". Poster:

Kofer W, Håkansson G, Glimelius K. *"Mitochondrial DNA affects floral development and male fertility of Nicotiana tabacum"*.

27 September-1 October. III^e cycle romand en sciences biologiques, Villars-sur-Ollon, Switzerland: Signal Transduction in Biological Systems. Invited lecture *"Regulation of photosynthesis by protein phosphorylation"*. Chairman and organiser of Journal Club (JFA).

2 October. Eidgenössische Technische Hochschule, Zürich, Switzerland. Institute for Molecular Biology and Biophysics. Seminar *"Protein phosphorylation in regulation of photosynthesis"* (JFA).

2 October. Biozentrum, University of Basel, Basel, Switzerland. Department of Microbiology. Seminar *"Protein phosphorylation in regulation of photosynthesis"* (JFA).

16 November. The Linnean Society of London, London, U.K.. Educational Lectures for Sixth Form Students. Invited lecture. *"Photosynthesis and Molecular Evolution"* (JFA).

26 November. Umeå University, Sweden. Department of Plant Physiology. Seminar *"Phosphorylation of LHC II: membrane and protein structural implications"* (JFA).

5-7 December. Scheele Symposium on Oxygen, Royal Swedish Academy of Sciences, Stockholm, Sweden. Participant (CAA, JFA).

1993

18 January. Plant Biochemistry Laboratory, Royal Veterinary and Agricultural University, Copenhagen, Denmark. Seminar *"Cyclic photophosphorylation"* (JFA).

24 February. Lund University, Sweden. Lund Molecular Biology Seminar Series. *"Protein phosphorylation in redox control of photosynthesis: structural and evolutionary predictions"* (JFA).

10-13 May. EMBL Conference on Structural Biology. EMBL, Heidelberg, Germany. Two poster presentations (LC, DS). *"Structure of N-terminal fragments of LHCI in phosphorylated and non-phosphorylated state"* (Stys D, Drakenberg T, Spangfort M, Forsén S, Allen JF).

20-23 May. Ruhr Universität Bochum, Bochum, Germany. DFG Forschergruppe meeting Expression und Interaktion von Funktionselementen in der Biogenese pflanzlicher Organellen. Guest speaker on “Molecular biology of thylakoid function”. “*Thylakoid protein phosphorylation in regulation of chloroplast function and assembly*” (JFA).

3 June. Ludwig-Maximilians-Universität, Munich, Germany. Botanisches Institut. Seminar “*Regulation of photosynthesis by protein phosphorylation in chloroplasts and cyanobacteria*” (JFA).

28 June-2 July. Conference Jacques Monod de la CNRS, Aussois, France, “Protein-protein interactions in the photosynthetic apparatus”. Poster and oral presentation “*Phosphorylation determines the structure of the N-terminus of chloroplast LHC II: NMR studies of synthetic peptides*”. Chairman of session. (JFA).

4-9 July. 22nd Meeting of the Federation of European Biochemical Societies, Stockholm, Sweden. Poster presentations (LC, GH, AS). “*Changes in the phosphorylation state of small polypeptides from thylakoid membranes in light and dark. A new mechanism and a new kinase*” (LC, DS, JFA); “*Use of a synthetic phosphorylated peptide as a substrate of pea thylakoid phosphatase*” (DS, LC, JFA).

4-6 November. Second Nordic Conference on Photosynthesis, Oslo, Norway. Eight poster presentations (CAA, JFA, KA, GH, DS, LC, TS); three lectures (CAA, GH, DS; participant (AT); and chairmanship of session “Photosystem II” (JFA). Lectures: Gunilla Håkansson, “*Redox regulation of gene expression in chloroplast and mitochondria of higher plants*”; Carol A. Allen, “*Redox control of protein synthesis and protein phosphorylation in isolated chloroplasts*”; Dalibor Stys, “*Structure of an N-terminal fragment of chloroplast LHC II in its phosphorylated form*”. Posters: Krassimir Alexiev, “*Structural studies on pea LHC II phosphorylation: expression of the N-terminus of the protein*”; Todd Silverstein, Lüling Cheng and John F. Allen, “*Redox control of thylakoid protein phosphorylations*”; André Struglics, Robin Ghosh and John F. Allen, “*Phosphorylation of light-harvesting polypeptides in vitro in chromatophores of the purple photosynthetic bacterium Rhodospirillum rubrum*”; John F. Allen, “*An hypothesis for the function of chloroplast genomes*”; Carol A. Allen and John F. Allen, “*Redox control of protein synthesis and protein phosphorylation in isolated chloroplasts*”.

Seminar speakers

Plant Cell Biology Seminar Series and *Lund Molecular Biology Seminar Series

1992

3 November. Colin Robinson (Warwick University)

"Mechanisms and energetics of thylakoidal protein transport"

17 November. Gunilla Håkansson (Lund University)

"Nuclear-mitochondrial interactions and male sterility in Nicotiana"

24 November: Wim Vermaas (Arizona State University)

"Photosystem II function probed by site-directed mutagenesis"

Stenbjörn Styring (Stockholm University)

"Three-dimensional structure of redox-active tyrosine residues in Photosystem II"

Beston Nore (Stockholm University)

"Purification and identification of the cyanobacterial 15 kDa phosphoprotein"

Michael Harrison (Leeds University)

"Long-term and short-term acclimation of the photosynthetic apparatus in Dunaliella salina"

8 December. Huashi Gong (Oslo University)

"In vivo studies on photoinhibition of photosynthesis and degradation of the D1 protein of Photosystem II"

1993

5 January Julian Eaton-Rye (Arizona State University)

"Structural and functional studies of photosystem II proteins in higher plants and cyanobacteria"

19 January Todd Silverstein (Willamette University, Oregon)

- “Molecular mechanisms of H⁺ pumps”*
- 9 February Dalibor Stys (Lund University)
“Structure of proteins by NMR”
- 9 March Andrew C. Cuming (Leeds University)
“Gene expression during cereal embryo development”
- 10 March* Werner Kühlbrandt (E M B L, Heidelberg)
“3-D structure of the plant light-harvesting complex”
- 30 March Axel Brennicke (Institut für genbiologische forschung, Berlin)
“RNA-editing and trans-splicing in plant mitochondria”
- 26 May* R. John Ellis (Warwick University)
“Molecular chaperones: the Anfinsen cage model for chaperonin action”
- 22 June Krassimir Alexciev (Lund University)
“Expression of BR genes in Chironomus tentans: Structure of specific pre-mRNP particles”
- 21 September Eva Sundberg (Uppsala University)
“Isolation of Arabidopsis thaliana genes by transposon tagging based on the maize transposable elements Ac and Ds”
- 5 October Dalibor Stys (Lund University)
“Structure of a phosphorylated fragment of LHC II. Various roles of the phosphate group in the structure at different degrees of protonation”
- 6 October* Günter Schneider (SLU & Biomedical Center, Uppsala)
“Improving photosynthesis: protein engineering of Rubisco”
- 9 November John H. Golbeck (University of Nebraska, Lincoln)
“Site-specific mutagenesis of the cysteine ligands to iron-sulfur centers FX, FB and FA and the effect on forward electron flow in photosystem I: a marriage of molecular biology and biophysics”
- 23 November Irmgard Sinning (Uppsala University and BMC)
“Proton transfer pathway to QB in Rhodospseudomonas viridis”

Teaching

Plant Cell Biology now offers two courses:

“Photosynthesis” (jointly with Plant Biochemistry) is a 5-point graduate (forskarutbildning) course first put on in Spring 1993. “The structure and organisation of photosynthetic systems in relation to their function, regulation, assembly and evolution. Photosynthesis is the conversion of light energy into chemical potential energy. Energy transduction takes place in specialised membranes of plants, algae and bacteria. These contain specific protein complexes for different steps of energy transduction: light-harvesting complexes; reaction centres; and electron transport components. Assimilation of CO₂ is tightly coupled to energy transduction in most photosynthetic organisms. The lectures highlight recent developments in understanding the structure and function of these components and their interactions. Lectures also cover the membrane organisation of photosynthetic systems, with special reference to the chloroplast thylakoid. The molecular and structural basis of regulation of photosynthesis is considered, with the biosynthetic and assembly processes that follow expression of genes encoding the major protein complexes. Practical classes are held on chloroplast isolation and electron transport, on spectroscopic detection and quantification of components, on chlorophyll fluorescence spectroscopy and kinetics, and on synthesis of a reaction centre protein. Students attend 15 lectures, do five days of practical work, and prepare and present recent findings in a colloquium ‘Topics in photosynthetic research.’”

“Molecular Cell Biology”. In spring 1994 we will also offer a 10-point “C” level course (advanced undergraduate) called “Molecular Cell Biology”, using Alberts et al “The Molecular Biology of the Cell” (Garland Publishing) as a text book, and recruiting a number of specialist lecturers from within Lund University, from elsewhere in Sweden, and from Germany and England.

In addition, members of Plant Cell Biology contributed lectures to Lund University courses in:

Biomembranes and Bioenergetics (JFA)
Plant Physiology (JFA)
Microbiology (JFA)
Physical Chemistry (DS)

Dalibor Stys lectured in the external course of Physical Chemistry 2 “Biomolecular NMR Spectroscopy; Theory and Practice”, October 24-29, 1993, and contributed to the following courses:

Modern Methods in Biochemical Research - NMR (2 hours), University of Chemical Technology, Prague, 1992.

Biochemical Methods - NMR (4 hours), Charles University of Prague, 1992.

Practice in Biochemical Methods (supervisor of 2 students of University of Chemical Technology, Prague, 3 weeks) 1992.

Dalibor Stys supervised the diploma project “NMR and CD study of structure of peptide fragments of LHCII and glycogen phosphorylase”, University of Chemical Technology, Prague, 1992-93.

Gunilla Håkansson gave two lectures "Mitokondriegenomet och CMS" Inst. f Växtförädling, Sveriges Lantbruksuniversitet, Uppsala, 921026.

Gunilla Håkansson participated in the Pedagogisk grundkurs för MN-lärare, ht -93 (6 days).

Other professional activities

Anders Kylin served in August 1992 as one of six international scientists on the Review Committee for Biology of the Royal Netherlands Academy of Arts and Sciences, visiting and evaluating Biology Departments in Universities in the Netherlands.

Anders Kylin edited about 150 manuscripts per year for the journal *Physiologia Plantarum*, among these the *Proceedings of the Third International Symposium on Inorganis Nitrogen Assimilation*.

John F. Allen took part in the following PhD examinations:

15 April 1992. Stockholm University. Opponent in PhD examination of Fredrik Nilsson, Department of Biochemistry.

29 May 1992. University of Oslo. Committee member and chairman in Dr.Scient. examination of Huashi Gong, Department of Biology.

27 May 1992. Stockholm University. Committee member in PhD examination of Abdalla Mohamed Jama, Department of Biochemistry.

1 July 1992 University of Amsterdam. Opponent in PhD examination of Georg W M van der Staay, Laboratory for Microbiology.

27 November 1992. Umeå University. Opponent in PhD examination of Stefan Jansson, Department of Plant Physiology.

11 December 1992. Lund University. Committee member in PhD examination of Claes von Wachenfeldt, Department of Microbiology.

19 February 1993. Lund University. Opponent in PhD examination of Eva Andreasson, Department of Biochemistry.

John F. Allen: served on the appointment committee for the Chair of Plant Physiology, University of Copenhagen, March-October 1993; reviewed grant applications for the UK Agriculture and Food Research Council, US National Science Foundation, US Department of Agriculture, European Molecular Biology Organisation, and the US International Science Foundation; and reviewed manuscripts for a number of journals, including *Biochimica et Biophysica Acta*, *European Journal of Biochemistry*, *Molecular Microbiology*, *Photosynthesis Research*, and *Physiologia Plantarum*.

Ilga Liljenberg and John F. Allen. Plant Cell Biology is the Department co-ordinating the Lund Molecular Biology Seminar Series for 1993-94.

Carin Jarl. European patent WO 92/ 20215. “Improvements in or relating to organic compounds”. C I Jarl, A Kool, E M Rietveld.

Publications

- 1 ALLEN, J F (1992)
Protein phosphorylation in regulation of photosynthesis. *Biochim. Biophys. Acta* 1098, 275-335

- 2 ALLEN, J F (1992)
How does protein phosphorylation regulate photosynthesis? *Trends Biochem. Sci.* 17, 12-17

- 3 ALLEN, J F (1992)
Molecular structural effects of protein phosphorylation in regulation of photosynthesis. In: Murata, N. (ed.) *Research in Photosynthesis* Kluwer Academic Publishers, Dordrecht. Vol I pp. 243-246

- 4 ALLEN, J F (1992)
Protein phosphorylation and LHCII structure. Reply from Allen. *Trends Biochem. Sci.* 17, 346-347

- 5 GONG, H, NILSEN, S and ALLEN, J F (1992)
A photodamage process which is distinguishable from photoinactivation is characterized as inactivation of multiple sites. In: Murata, N. (ed.) *Research in Photosynthesis* Kluwer Academic Publishers, Dordrecht. Vol IV pp.549-552

- 6 HARRISON, M A and ALLEN, J F (1992)
- Protein phosphorylation and Mg^{2+} ions influence light-harvesting and electron transport in chloroplast thylakoid membrane material containing only the chlorophyll-*a/b*-binding light-harvesting complex of photosystem II and photosystem I. Eur. J. Biochem. 204, 1107-1114
- 7 HARRISON, M A, MELIS, A and ALLEN, J F (1992)
- Restoration of irradiance-stressed *Dunaliella salina* to physiological growth conditions: changes in antenna size and composition of Photosystem II. Biochem. Biophys. Acta 1100, 83-91
- 8 HÅKANSSON G (1992)
- Nuclear-mitochondrial interactions and its relevance for male sterility in Nicotiana.. Doctoral thesis at Department of Plant Breeding, University of Agricultural Sciences, Uppsala, Sweden. SLU/Repro, Uppsala, 1992, ISBN 91-576-4572-8
- 9 HÅKANSSON G, KOFER W, and GLIMELIUS K (1992)
- Mitochondrial effects of nuclear and mitochondrial restoration of CMS in Nicotiana. in: A Brennicke, U Kück (eds) Plant Mitochondria, VCH Publishers, Weinheim
- 10 LÖNNROTH, A, ALEXCIEV, K, MEHLIN, H, WURTZ, T, SKOGLUND, U and DANEHOLT, B (1992)
- Demonstration of a 7 nm RNP fiber as the basic structural element in a premessenger RNP particle. Exp. Cell Res. 199, 292-296
- 11 NORE, B F, HARRISON, M A and ALLEN, J F (1992)
- Partial purification of the 15 kDa phosphoprotein of *Synechococcus* 6301. In: Murata, N. (ed.) *Research in*

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pp. 345-348

- 12 PAVLICKOVA L, STYS D, SOUCEK M, URBAN J, HRUSKOVA O, SEDLACEK J, and STROP P. (1992)

¹⁵S-gag Proteinase of Myeloblastosis-Associated Virus: Specificity Studies with Substrate-Based Inhibitors. *Arch. Biochem. Biophys.* 298, 753-756

- 13 ALEXCIEV, K, WURTZ, T, LÖNNROTH, A and DANEHOLT, B (1993)

The elementary RNP fiber - not the higher order structure - determines the all-or-none disintegration behaviour of Baibiani ring pre-messenger RNP particles upon RNase A treatment. *Biol.Cell* 77, 165-172

- 14 ALLEN, J F (1993)

Control of gene expression by redox potential and the requirement for chloroplast and mitochondrial genomes. *J. Theor. Biol.* 165, 609-632

- 15 ALLEN, J F (1993)

Redox control of gene expression and the function of chloroplast genomes - an hypothesis. *Photosynthesis Res.* 36, 95-102

- 16 ALLEN, J F (1993)

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