

Thirty Years of International Symposia on Plant Lipids

Hartmut K. Lichtenthaler

Botany II (Molecular Biology and Biochemistry of Plants), University of Karlsruhe, Kaiserstr. 12, D-76128 Karlsruhe, Germany
hartmut.lichtenthaler@bio.uka.de

Abstract: After several years of contacts between individual European plant lipid biochemists, the International Symposia on Plant Lipids (ISPL) were started in 1974 by an initiating Plant Acyl Lipid Symposium in Norwich, organized by Terry Galliard. In 1976 the topics were extended at the Karlsruhe Symposium (2nd ISPL) by including all the other plant lipids, such as isoprenoid lipids (sterols, carotenoids and prenyl side chains of chlorophylls and prenylquinones) and lipid polymers. Since then the International Symposia on Plant Lipids (ISPL) have been held every other year. Their goal is to promote scientific cooperation between work groups of different countries, and they have resulted in fast progress in all fields of plant lipid biochemistry. On the occasion of the 16th International Symposium on Plant Lipids in Budapest in June 2004 a brief history of these symposia has been presented here.

These symposia also were the start of a series of meetings on plant lipids in Germany, in the USA and in Japan.

List of Contents:

1. The beginnings.....	1
2. The first international symposium on plant lipids (1 st ISPL).....	4
3. The second international symposium on plant lipids (2 nd ISPL).....	7
4. The impact of the Norwich and Karlsruhe symposia for the future plant lipid symposia.....	10
5. The Terry Galliard Memorial Lecture and Medal.....	14
6. The organization of the ISPL by the international board.....	15
7. The German-speaking plant lipid workshops (Arbeitstagungen Pflanzliche Lipide).19	
8. The meetings of the national plant lipid cooperative NPLC in USA.....	20
9. The Annual Symposia of the Japanese Association of Plant Lipid Researchers (JAPLR).....	21
10. References.....	23

1) THE BEGINNINGS

In the first two decades after the World War II, modern experimental physiological and biochemical plant research developed in Europe and the USA due to the availability of new experimental instrumentation and methods. First contacts between scientists of different countries started in the 1960s by individual initiatives. European congresses and meetings, held in most fields of plant biology these days, did not exist at the time. Scientific contacts were greatly enhanced by the First International Photosynthesis Congress in Freudenstadt, Black Forest, Germany, in May 1968. This congress gathered about 230 young as well as established scientists from Eastern and Western Europe and also the leading photosynthesis colleagues from the USA and a few from Japan (as can be seen from the proceedings book "Progress in Photosynthesis" edited by Helmut Metzner in 1969). This congress had a great

impact not only on European and international photosynthesis research, but also on many other fields of plant biology, and it started and considerably promoted scientific cooperation, particularly in Europe.

The Impact of Photosynthesis Research on Plant Lipid Research

Many European photosynthesis scientists either met on their congress in Freudenstadt 1968 for the first time or in the USA as postdocs and since then have stayed in touch. In fact, several plant lipid scientists had started their research in photosynthesis and later extended their research to plant lipid biochemistry. They continued their scientific exchange over the following decades even if they changed or extended their photosynthesis-related research to other topics, such as the photosynthetic biomembrane lipids and their effect or interaction with photosynthetic function. Among them are *Andy A. Benson*, *Hartmut Lichtenthaler*, *Wilhelm Menke*, *Norio Murata*, *Paul-André Siegenthaler* and *Sjef F.G.M. Wintermans*, just to name a few. Their individual contributions to the early plant lipid research is indicated below. The importance of the glyco- and phospholipids as well as the non-acyl lipids, such as the isoprenoid chlorophylls, carotenoids and prenylquinones for the functioning of the photochemically active thylakoids, had become evident through the pioneer paper with the complete lipid composition of thylakoids (Lichtenthaler and Park 1963). On the basis of that thylakoid lipid composition, Lichtenthaler discussed in great detail with *Andy Benson*, during a visit to La Jolla in the fall of 1963, the possible orientation of chlorophylls, carotenoids and prenylquinones in the acyl lipid moiety of either a mono- or a bimolecular lipid layer of thylakoids. Also at the Freudenstadt Photosynthesis Congress in 1968 several colleagues discussed the significance of acyl lipids and prenyllipids for the photosynthetic function, e.g. *Trevor Goodwin* and Hartmut Lichtenthaler disputed there with several other colleagues on various aspects of lipid involvement in chloroplast biogenesis with emphasis on the biosynthesis and function of carotenoids and prenylquinones, topics that later became essential parts of the International Symposia on Plant Lipids. The famous photosynthesis researcher Prof. *Wilhelm Menke* (Cologne) was a pioneer in plant lipid research. In fact, he was the first scientist to isolate spinach chloroplasts by centrifugation (Menke 1938), had checked their relative lipid amounts as compared to cytoplasmic fractions (Menke and Jacob, 1942), and later created the name “thylakoids” for the photosynthetic biomembrane (Menke 1961). In the early 1960s *Ernst Heinz* started his Ph.D. dissertation on plant acyl lipids with W. Menke and later was coorganizer of the 2nd ISPL in Karlsruhe. The chemist *Waldemar Eichenberger* from the University of Bern spent his postdoc years 1964-1965 with Menke in Cologne analyzing steryl glycosides and acylated sterols in plants, detecting that chloroplasts did not contain sterols (Eichenberger and Menke 1966). Thus, essential impulses for plant lipid research came from various photosynthesis laboratories that tried to find the function of individual acyl lipids and prenyllipids in the photochemically active thylakoids.

The Role of European Postdocs in the USA

Another decisive impulse for the establishment of the International Symposia on Plant Lipids came from various young European scientists who had spent one or two postdoc years in well-equipped laboratories in the USA. After their return to Europe they kept or searched for contacts with other plant lipid researchers who had been postdoc in the USA. The laboratory of *Paul Stumpf* in Davis/California was an early center of plant fatty acid and lipid research where in the late 1960s and early 1970s *Terry Galliard* (Norwich), *John Harwood* (Cardiff), *Lars-Åke Appelqvist* (Stockholm), *P. Castelfranco* (USA), and *J. Brian Mudd* (USA) spent their postdoc years. Later more scientists, such as *J. Joyard* (France), *R. Lessire* (France), *D. J. Murphy* (England), *J. Ohlrogge* (USA), *J. Sanchez* (Spain), *M. Yamada* (Japan), joined his laboratory. All of them, Paul Stumpf's postdocs of the early and later years, as well as Paul Stumpf himself, contributed a great deal to the International Symposia on Plant Lipids, some

of these former postdocs from the very beginning and others after the ISPL had been established. In fact, those who are underlined later became organizers or co-organizers of one of the ISPL.

Another early center for plant lipid research in the USA was the laboratory of *Andrew A. Benson* (plant sulfolipids), where *Joseph F.G.M. Wintermans* (Nijmegen) in 1958 (then at State College, Pennsylvania) and later *H. Pohl* (Kiel) 1974 (then at his laboratories in La Jolla) spent their postdoc time. Andy A. Benson, the co-detector of the photosynthetic carbon fixation cycle (Calvin-Benson-cycle), had extended his research topic in the late 1950s and early 1960s to the detection and investigation of plant sulfolipids (Benson et al. 1959a and b), and his first European postdoc J.F.G.M. Wintermans was later organizer of the 5th ISPL. In the early 1970s *Roland Douce* (Grenoble), another European postdoc of Andy Benson isolated the chloroplast envelope (Douce et al. 1973) and started to analyze the lipid biosynthesis capacity of the chloroplast envelope (Douce 1974). In 1980 he became co-organizer of the 4th ISPL in Paris. *Hartmut Lichtenthaler* (Karlsruhe) had been a postdoc in Melvin Calvin's laboratory in Berkeley/California from 1962 through 1964 and worked out the prenylipid composition (chlorophylls, carotenoids, plastoquinone-9, phylloquinone K1, tocopherol) of the photosynthetic membrane (Lichtenthaler and Calvin 1964) and also published the first list with the quantitative levels of all thylakoid lipids (Lichtenthaler and Park 1963). Later he was the organizer of the 2nd ISPL in Karlsruhe in 1976. *Paul-André Siegenthaler* (Neuchâtel) had been a postdoc in Lester Packer's laboratory at the University of Berkeley from 1963 to 1965 working on the light-induced chloroplast shrinking, where he detected that free fatty acids could uncouple photosynthetic phosphorylation. Since 1980 he has been participating in the ISPL and became the organizer of the 6th ISPL in Neuchâtel in 1984. Having first been in Menke's laboratory, W. Eichenberger was a postdoc in 1966 with David W. Newman (Oxford, Ohio) performing research on the biosynthesis of steryl glycosides from UDP-hexose (Eichenberger and Newman 1968). W. Eichenberger, then a sterol specialist, participated in the 2nd ISPL in Karlsruhe, and in 1984 he became co-organizer of the 6th ISPL in Neuchâtel /Switzerland. Also D. W. Newman (USA) took part in the Karlsruhe ISPL.

After having returned to Germany (to Münster/Westphalia) in 1964 H. K. Lichtenthaler established close contacts with *Joseph Wintermans* in the neighboring Nijmegen/Netherlands and they co-operated in the lipid composition of the osmiophilic plastoglobuli of chloroplasts (Lichtenthaler 1968). Wintermans was a pioneer in chloroplast acyl lipid research and was the first to determine the phospho- and glycolipid levels of whole leaves and isolated chloroplasts of spinach and related them to the chlorophyll content (Wintermans 1960). He continued to work on the biosynthesis of plant acyl lipids (Wintermans 1966, Wintermans et al. 1969) with particular emphasis in the field of biosynthesis of galactolipids (van Besouw and Wintermans 1978). Later he became the organizer of the 6th ISPL in Groningen/Netherlands. Lichtenthaler, although continuing in photosynthesis and in prenylipid research (e.g. pigment and prenylquinone composition of the two photosynthetic photosystems (Lichtenthaler 1969), motivated his Ph.D. student *Manfred Tevini* to perform research on the accumulation of plant acyl lipids during plant and chloroplast development. Both were organizers of the 2nd ISPL in Karlsruhe in 1976. In England Prof. *A.T. James* at the Unilever research laboratories formed another center for lipid research. Although research there was not directly focused on the particular function of individual plant lipids, he established and arranged contacts with several European plant lipid researchers. He also inspired them to write articles in "Endeavour", e.g. on the osmiophilic plastoglobuli of chloroplasts as a reservoir for excess plastid lipids (Lichtenthaler 1968). Thus, in the early 1970s several European research groups, some of them headed by former postdocs in USA and also various others, not only became aware of

each other but also started to have some contacts and exchange of results and ideas, and later became regular participants of the ISPL.

The Years 1972 and 1973

In summer of 1972 the *15th International Conference of Biochemistry of Lipid (ICBL)*, organized by D.A. van Dorp, took place in Den Haag/Netherlands. Its main topic was “Enzyme reactions in Lipid Biochemistry”. Although it primarily dealt with enzyme reactions concerning general metabolism and also biosynthesis of animal and human acyl lipids, various *plant lipid biochemists* participated in that congress. Lichtenthaler recalls that he met there again Joseph Wintermans and also *Paul Mazliak* with his coworker *Jean-Claude Kader*, as well as A.T. James, Terry Galliard and several others. Also *Friedrich Spener*, Münster, who later participated in many of the ISPL, remembers that it was his first participation in such an international congress where he became acquainted with leading lipid biochemists. On this ICBL the discussion started among the few plant lipid scientists on the need of a small European and international symposium dedicated solely to plant lipids, their accumulation, metabolism, intracellular localization, biosynthesis and function. Yet it took some more time before Terry Galliard would organize the first international symposium on plant acyl lipids in Norwich in 1974.

In 1973, when Paul Stumpf visited the United Kingdom, *Terry Galliard* and Mike Gurr organized a meeting of all *U.K. plant lipid biochemists* at Unilever Colworth House in Sharnbrook/Bedford, which dealt with the biosynthesis and biochemistry of plant fatty acids and acyl lipids. John Harwood recalls that the Unilever laboratory “in those days was the only laboratory to rival Stumpf’s”. At the meeting, the idea of an international symposium on plant lipids was again proposed, and Terry Galliard and Mike Gurr put together a meeting in Norwich in 1974.

2) THE FIRST INTERNATIONAL SYMPOSIUM ON PLANT LIPIDS (1st ISPL)

This meeting, organized by *Terry Galliard* as a joint international symposium of the “Phytochemical Society” and “The Lipid Group of the Biochemical Society”, was held with the title “*RECENT ADVANCES IN THE CHEMISTRY AND BIOCHEMISTRY OF PLANT LIPIDS*”. We know little on Terry Galliard’s preparations of this first ISPL in Norwich and how he selected and activated the speakers for this plant acyl lipid symposium. He achieved financial support from the Royal Society, the Potato Marketing Board, Tato & Lyle Ltd. as well as Unilever (UK) Ltd. so that, effectively, there was no registration fee. A small “registration fee” of 2.50 pounds paid for coffee and tea in the breaks. John Harwood recalls: “The inexpensive nature of the meeting meant that many students attended; about one half of the participants were Ph.D. students or very young post-doctorals” mainly from UK. There were receptions for all participants which were provided by the Trustees of the John Innes Charity, the University of East Anglia and the Food Research Institute. An additional symposium dinner costed only 3.30 pounds!

It was Terry Galliard’s personal initiative and engagement to organize such a symposium. As a former postdoc of Paul Stumpf in the USA he knew well the need for an international plant lipid discussion forum. He had various contacts to other plant lipid scientists within Europe and the USA as well. These were at that time only a rather small number of persons, and he activated these colleagues to participate in the 1974 Norwich symposium. This was a great achievement. All members of the today “international family of plant lipid scientists” are

grateful to Terry Galliard for finally having started this international symposium on plant acyl lipids which was the first ISPL of many others to follow.

Officially, this ISPL had been organized by Terry Galliard (Hull) with the help of *M. J. Gurr* (Unilever, Sharnbrook), *E. J. Mercer* (Aberystwyth) and *M.J.C. Rhodes* (Norwich), yet Terry Galliard was the driving force for this symposium that was arranged at the University Residences, Fifers Lane, Norwich. That Terry Galliard was the effective motor and organizer of this ISPL has now been confirmed by Mike Gurr who recently commented “I was only a very minor adviser”. The symposium lasted two and a half days (April 8 to April 10, 1974) and 12 lectures were given. Although the symposium was rather short and brought together only about 25 established plant lipid scientists out of the total of 90 participants, it was the essential breakthrough and starting point for the many ISPL to come (see Table 1 on the next page) and for the later formation of the international plant lipid family as we know it today.

The following were lecturers at Norwich: L.-Å. Appelqvist (Stockholm), Harry Beevers (Santa Cruz), Terry Galliard (Norwich), F.D. Gunstone (St. Andrews), John L. Harwood (Cardiff), C. Hitchcock (Unilever), M. Kates (Ottawa), P.E. Kolattukudy (Pullman), P.C.J. Kuiper (Wageningen), Paul Mazliak (Paris), J.B. Mudd (Riverside), Paul K. Stumpf (Davis). The titles of their lectures are given in Table 2. About 90 scientists and Ph.D. students, most of them from the U.K., participated in this symposium, but only a smaller number of them were directly involved in plant lipid research. Among them were, besides the above lecturers, the plant lipid scientists J. Friend (Hull), T.W. Goodwin (Liverpool), Ernst Heinz (Köln), A.T. James (Unilever), R.G.O. Kekwick (Birmingham), Rachel M. Leech (York), D.M. Lösel (Sheffield), H.K. Mangold (Münster), Alfons Radunz (Köln), Eva Selstam (Göteborg), Manfred Tevini (Karlsruhe), D.R. Threlfall (Hull), A. Trémolières (Paris).

Those underlined among the lecturers and participants named above were organizers or co-organizers of future international symposia on plant lipids.

Table 2. Lecturers and titles of lectures given at the first international plant lipid symposium in Norwich in April 1974.

C. Hitchcock	Structure and distribution of plant lipids
J.L. Harwood	Fatty acid biosynthesis
P.K. Stumpf	Biosynthesis of chloroplast lipids
F.D. Gunstone	Determination of the structure of fatty acids
L.-Å. Appelqvist	Biochemical and structural aspects of storage and membrane lipids in developing seeds
H. Beevers	Organelles from fatty seedlings: biochemical roles in gluconeogenesis and phospholipid biosynthesis
M. Kates	Biosynthetic pathways for phospholipid synthesis in spinach leaves
J.B. Mudd	Biosynthesis of glycolipids
P.E. Kolattukudy	Biochemistry of surface lipids
P. Mazliak	Exchange processes between organelles involved in membrane lipid biosynthesis
P.J.C. Kuiper	Role of lipids in water and ion transport
T. Galliard	Degradation of plant lipids by hydrolytic and oxidative enzymes.

Table 1. List of the International Symposia on Plant Lipids, the ISPL.

Nr.	Year	Place	Main Organizer
1)	1974: April 8-10	Norwich (UK)	Terry Galliard
2)	1976: July 18-21	Karlsruhe (Germany)	Hartmut Lichtenthaler
3)	1978: August 28-30	Göteborg (Sweden)	Conny Liljenberg
4)	1980: July 4-7	Paris (France)	Paul Mazliak
5)	1982: June 7-10	Groningen (Netherlands)	Josef F.G. Wintermans
6)	1984: July 16-20	Neuchatel (Switzerland)	Paul-André Siegenthaler
7)	1986: July 27-August 1	Davis (USA)	Paul K. Stumpf
8)	1988: July 25-28	Budapest (Hungary)	Peter Biacs
9)	1990: July 9-13	Wye (UK)	Peter J. Quinn
10)	1992: April 27-May 2	Djerba (Tunisia)	Abdelkader Cherif
11)	1994: June 26-July 1	Paris (France)	Jean-Claude Kader
12)	1996: July 7-12	Toronto (Canada)	John P. Williams
13)	1998: July 5-10	Sevilla (Spain)	Juan Sánchez
14)	2000: July 23-28	Cardiff (UK)	John Harwood
15)	2002: May 12-17	Okazaki (Japan)	Norio Murata
16)	2004: June 1-4	Budapest (Hungary)	Peter Biacs
17)	2006: July 15-21	East Lansing (USA)	Christoph Benning

The contributions of the lectures of this first ISPL in 1974 were published as a proceedings book with T. Galliard and E.I. Mercer as editors in 1975 (see Table 2). It was natural that this book was reviewed by Andy A. Benson (La Jolla) who, as detector of the plant sulfolipid and of phosphatidyl-glycerol (Benson et al. 1959 a and b), was one of the pioneers of plant acyl lipid research. His extremely positive review started with the sentence: “In its 12 chapters the book covers fatty acid structure methodology, biosynthesis and their roles in plant lipid function” and ending with “The book will be a standard reference for a long while” (Benson 1976) and, in fact, it was.

The plant lipid scientists among the participants in Norwich discussed a continuation of such international plant lipid symposia and agreed with the proposal of the German participants Manfred Tevini, Ernst Heinz and H.K. Mangold that the next symposium might possibly be held in Karlsruhe/Germany in 1976. Hartmut Lichtenthaler (who could not participate in Norwich but had sent Manfred Tevini) acted then together with Manfred Tevini as the main organizers for this 2nd ISPL.

Table 3. Proceedings Books of the International Symposia on Plant Lipids. (The years given indicate the year of the symposium, some of the books appeared one year later. The last proceedings of the 16th ISPL are published only in the web.)

Year	Publisher	Editors	Title	Dedicated to
1974	Academic Press	T. Galliard E.J. Mercer	Recent Advances in the Chemistry and Biochemistry of Plant Lipids	
1976	Springer Verlag	M. Tevini H.K. Lichtenthaler	Lipids and Lipid Polymers in Higher Plants	
1978	Elsevier	L.-A. Appelquist C. Liljenberg	Advances in the Biochemistry and Physiology of Plant Lipids	
1980	Elsevier	P. Mazliak et al.	Biogenesis and Function of Plant Lipids	J. Wintermans
1982	Elsevier	J. Wintermans P. Kuiper	Biochemistry and Metabolism of Plant Lipids	Paul.K. Stumpf
1984	Elsevier	P. Siegenthaler W. Eichenberger	Structure, Function and Metabolism of Plant Lipids	Morris Kates
1986	Plenum Press	P. Stumpf, J. Mudd, W. Nees	Metabolism, Structure and Function of Plant Lipids	Andrew Benson
1988	Plenum Press	P.A. Biacs et al.	Biological Role of Plant Lipids	Hartmut. K. Lichtenthaler
1990	Portland Press	P.J. Quinn J.L. Harwood	Plant Lipid Biochemistry, Structure and Utilization	J. Brian Mudd
1992	Centre National	A. Cherif et al.	Metabolism, Structure and Utilization of Plant Lipids	Paul Mazliak
1994	Kluwer Academic	J.-C. Kader P. Mazliak	Plant Lipid Metabolism	Terry Galliard
1996	Kluwer Academic	J.P. Williams et al.	Physiology, Biochemistry and Molecular Biology of Plant Lipids	G. Roughan
1998	University Sevilla	J. Sánchez et al.	Advances in Plant Lipid Research	Ernst Heinz
2000	Portland Press	J.L. Harwood P.J. Quinn	Recent Advances in the Biochemistry of Plant Lipids	Norio Murata
2002	Kluwer Academic	N. Murata M. Yamada et al.	Advanced Researches of Plant Lipids	Jean-Claude Kader
2004	Méte Budapest	P. Biacs	Proceedings of the 16 th International Plant Lipid Symposium	Tibor Farkas

3) THE SECOND INTERNATIONAL SYMPOSIUM ON PLANT LIPIDS (2nd ISPL)

The 2nd ISPL was held at the University of Karlsruhe from July 18 to 21, 1976, with the topic “*Lipids and Lipid Polymers in Higher Plants*”. H. Lichtenthaler and M. Tevini (both

Karlsruhe) organized this 1976 symposium with the support of H.K. Mangold (Münster) and E. Heinz (Köln) at the University Campus Karlsruhe. The intentions were to bring together in one place scientists from very different fields of plant lipids, such as fatty acids, glycolipids, phospholipids and lipid polymers, but in addition also those working on prenylipids and sterols who had not participated in Norwich. The emphasis was placed on biosynthesis, distribution and function of plant lipids and their role in biomembranes and epidermal cell walls. This 2nd ISPL was sponsored by two larger grants from (i) the Deutsche Forschungsgemeinschaft (German Research Council), Bonn, and (ii) the Erwin-Riesch-Foundation, Tübingen, as well as (iii) by donations of several private companies.

Broadening of Treated Topics

Lichtenthaler recalls: "It was our intention to broaden the topics of the symposium and to invite not only the colleagues working on fatty acids and acyl lipids of plants, but also those that were performing research with prenylipids, such as sterols, carotenoids, prenylquinones and the C₂₀ isoprenoid chain of chlorophylls. For these non-acyl plant lipids I had proposed the name *prenylipids* which was first used in the ISPL 1976 in Karlsruhe (see Lichtenthaler 1977, Goodwin 1977). Moreover, we also wanted to include lipid polymers, such as epicuticular waxes and cutins. Many of these "non-acyl lipid plant scientists" worked more or less isolated in their individual countries not having discussion partners in their own country. We were hoping to provide them with a joint forum for discussing their research results with their colleagues working on acyl lipids and to increase the number of participants. And, in fact, this worked out very well."

Main Lecturers and Participants

17 main lectures were given at the Karlsruhe symposium and 47 short oral contributions with original data. Of the 12 lecturers of the first ISPL in Norwich seven also presented their results at the Karlsruhe symposium. The sessions, lecturers and titles of the main lectures in Karlsruhe are summarized in Table 4, their contributions were published as a book by Springer Verlag (Springer Publishers) in 1977 with M. Tevini and H.K. Lichtenthaler as editors (see Table 3). Additional contributors and participants of the Karlsruhe symposium were many colleagues who participated and contributed also to the subsequent ISPL. Those participants of the Karlsruhe ISPL underlined below were organizers or co-organizers of ISPL following the one in Karlsruhe:

G. Akoyunoglou (Athens), L.-Å. Appelqvist (Stockholm), T.J. Bach (Karlsruhe), P. Benveniste (Strasbourg), M. Bertrams/Frentzen (Köln), F.G. Czygan (Würzburg), R. Douce (Grenoble), P. Gregory (Ithaca), E. Heftman (Berkeley), T. Galliard (Norwich), M. Gleizes (Bordeaux), E. Hartmann (Mainz), M.A. Hartmann (Strasbourg), J.L. Harwood (Cardiff), K.P. Heise (Göttingen), P.J. Holloway (Bristol), J. Joyard (Grenoble), P. Karunen (Turku), R. Kekwick (Birmingham), H.W. Kircher (Tucson), H. Kleinig (Freiburg), P.J.C. Kuiper (Groningen), R. Lessire (Talence), B. Liedvogel (Freiburg), C. Liljenberg (Göteborg), P. Mazliak (Paris), J.D. Mikkelsen (Copenhagen), D.J. Morré (West Lafayette), D.J. Murphy (York), D.W. Newman (Oxford, USA), C. Péaud-Lenoel (Marseille), P. Pohl (Kiel), R. Pont Lezica (Argentina), A. Radunz (Köln), J. Rétey (Karlsruhe), M. Sancholle (Toulouse), E. Selstam (Göteborg), M. Signal (La Garenne), C. Sironval (Liège), F. Spener (Münster), D.R. Threlfall (Hull), A. Trémolière (Paris), A.F. van Besouw (Nijmegen), A. Weber (Hamburg), P. von Wettstein-Knowles (Copenhagen), R. Wilkinson (Griffin, USA), J. Williams (Toronto) and J.F.G.M. Wintermans (Nijmegen). Peter Biacs (Budapest), who had been scheduled as a speaker in Karlsruhe, could not make it the very last moment, but he participated in future symposia and was the organizer of the 8th ISPL and now of the 16th ISPL in Budapest 2004.

Table 4. Lecturers and titles of overview lectures of the Karlsruhe international symposium on plant lipids in July 1976 (2nd ISPL). These lectures were published in the book “Lipids and Lipid Polymers in Higher Plants”, M. Tevini and H.K. Lichtenthaler (eds.), Springer Verlag, Heidelberg 1977 (see Table 3).

Opening Session

P. Sitte , Freiburg	Functional organization of biomembranes
T.W. Goodwin , Liverpool	The prenyl lipids of the membranes of higher plants
P. Mazliak , Paris	Glyco- and phospholipids of biomembranes in higher plants

I. Physiology and Biochemistry of Fatty Acids and Glycerides

P.K. Stumpf , Davis	Biosynthesis of fatty acids by chloroplasts
H.K. Mangold , Münster	The cyclopentenyl fatty acids

II. Physiology and Biochemistry of Phospho- and Glycolipids

E. Heinz , Köln	Characterization of enzymatic reactions in glycolipid biosynthesis
M. Tevini , Karlsruhe	Light, lipids and plastid development

III. Physiology and Biochemistry of Plant Steroids

L.J. Goad , Liverpool	Biosynthesis of plant sterols
W. Eichenberger , Bern	Steryl glycosides and acylated steryl glycosides

IV. Physiology and Biochemistry of Prenyllipids

F.W. Hemming , Liverpool	The biosynthesis and physiological significance of prenols and their phosphorylated derivatives
B.H. Davies , Aberystwyth	Higher plant carotenoids
D. Siefertmann-Harms , Tübingen	The xanthophyll cycle
H.K. Lichtenthaler , Karlsruhe	Regulation of prenylquinone synthesis in higher plants
C. Liljenberg , Göteborg	Chlorophyll formation, the phytylation step

V. Lipid Polymers in Higher Plants

P.E. Kollatukudy , Pullman	Biochemistry of lipid polymers
P.J. Holloway , Bristol	The intermolecular structure of some plant cutins

Activation of Colleagues

In order to attract all colleagues working on lipid-soluble plant compounds to the 2nd ISPL in Karlsruhe it was clear that we had (*i*) to offer a good scientific framework program, inviting well-known speakers, (*ii*) to reduce the registration fee to an absolute minimum (30 Deutsch Marks) and (*iii*) to provide travel assistance to as many participants as possible. The registration fee (30 DM = ca. 7 pounds = 12 US \$ at that time) included book of Abstracts, coffee and tea at the breaks as well as the bus excursion to the Black Forest with dinner. Following the principles of the Erwin-Riesch-Stiftung, we supported with its donation the travel and/or accommodation expenses of young researchers and Ph.D. students and waived their registration fee, which is essential since they are the guarantors for the future meetings. We also took advantage of the fact that the 10th International Congress on Biochemistry (ICB) was held in London during the last week of July in 1976, and decided to organize the Karlsruhe Symposium just one week earlier. We proposed to several overseas colleagues,

whom we expected to come to the ICB in London, that we would pay their airfare from London to Karlsruhe. This then guaranteed a broader participation of our US-colleagues. Paul Stumpf was already in Germany on a sabbatical leave working with H.K. Mangold at the Federal Fat Research Institute in Münster /Westphalia. Trevor W. Goodwin, Liverpool agreed to participate and motivated some of his former co-workers in the field of isoprenoid lipids, such as L.J. Goad, B.H. Davies, F.W. Hemming and D.R. Threlfall. During his sabbatical in 1975 in Göteborg/Sweden, Lichtenthaler became acquainted with the Swedish colleagues *Conny Liljenberg*, *Eva Selstam* (both Göteborg) and *Lars-Åke Appelqvist* (Stockholm). All three Swedish colleagues participated in the Karlsruhe Symposium in 1976 and became the organizers of the 3rd ISPL in Göteborg in 1978.

“Thus, by activating the plant lipid colleagues in the different European countries and in the USA in a very personal way and many of them by providing travel aid, we could assemble a lot of them at our Karlsruhe symposium. The participation consisted of 140 plant lipid scientists and Ph.D. students from 14 countries, and all of them were involved in plant lipid research which enormously stimulated the scientific discussion on all levels. This was a clear improvement to the 1st ISPL in Norwich, where many of the participants were not involved in plant lipid research but came to listen to what was known about plant lipids.”

4) THE IMPACT OF THE NORWICH AND KARLSRUHE SYMPOSIA FOR THE FUTURE PLANT LIPID SYMPOSIA

The Birth of the International Plant Lipid Family

Lichtenthaler further recalls: "Some of the Karlsruhe participants already knew each other, e.g. from the Norwich symposium or earlier meetings or their stay as postdocs in USA, however others were fully new. We wanted to stimulate scientific discussion and cooperation by making sure that all participants became well known to each other. For this purpose we tried to mix people as often as possible by additional evening activities at different locations. Thus, the registration on Sunday afternoon and evening took place at the casino restaurant of the Federal Constitutional Court (Bundesverfassungsgericht) near the Karlsruhe Schloss (Karlsruhe Palace), there was a city hall reception on Monday evening, a joint dinner on Tuesday evening at the Heinrich Hertz-Gastdozentenhaus and, on late Wednesday afternoon, a bus excursion to the Black Forest and the wine country south of Baden-Baden followed by dinner for all participants in the wine village of Neuweier. The scientific sessions and discussions, the common daily lunches, the joint social activities as well as the special programs for the accompanying persons gave all the participants the feeling to belong to a larger scientific community that had much in common and mutual interests. In this way and in continuation of the Norwich symposium the *international plant lipid family* was born that, from now on, would meet every two years in a different country and grow with each further ISPL.”

Development of Cooperation between Plant Lipid Working Groups

The Norwich and Karlsruhe symposia on plant lipids were a strong stimulus for fast further progress in plant lipid research and for cooperation. Many participants realized that there were colleagues who worked either with other plant lipids or on different detailed aspects but often on the same scientific question. By exchanging their methods and combining their expertise they could make much faster progress than each individual laboratory, and moreover, they even could approach, in a joint cooperative effort, more complicated scientific problems. A few examples are given. Thus, Roland Douce and Hartmut Lichtenthaler with

their colleagues started to investigate if and which prenylquinones were present in the chloroplast envelope and determined their levels with respect to the level of the envelope carotenoids (Lichtenthaler et al. 1981). Later Wintermans' group cooperated with R. Douce on the localization of galactolipid and acyl transferases in the outer envelope of spinach chloroplasts (Hemskerk et al. 1986). Norio Murata, Japan, a photosynthesis researcher, who first participated in the 6th ISPL in Neuchâtel in 1984, was inspired to further his plant lipid research; and over the years he accepted many European researchers in his laboratory in Okazaki and later became the organizer of the 15th ISPL in 2002. The large impact of the biannual ISPL between 1976 and 1998 on plant lipid research and cooperation is well documented for the lipids involved in photosynthesis in the review book by P.A. Siegenthaler and N. Murata (eds.) 1998. Another example are *Mitsuhiro Yamada*, Japan, who worked in the 1980s during three exchange stays in the laboratory of *Jean-Claude Kader* in Paris, whereas the latter worked during several research programs in the laboratory of M. Yamada in Japan in a “friendly and fruitful, but hard competition on the LTPs, the lipid transfer proteins” as Jean-Claude Kader recalls. Also the contributions in the proceedings books of the ISPL (Table 3) demonstrate the increasing scientific cooperation of plant lipid research groups with each further ISPL.

After a few ISPLs were held, those who had participated, advertised these plant lipid meetings that were run in an open, familiar and cooperative discussion style. Many young scientists came for the first time to the following ISPL and kept participating in all the future ones. In this context I would like to mention John Ohlrogge as an example who will be a co-organizer of the 17th ISPL in East Lansing in 2006. He recalls when being asked how he learned about the ISPL and what attracted him: “The first ISPL I attended was Neuchâtel in 1984. I learned about this plant lipid meeting through other colleagues, such as Paul Stumpf. This ISPL was one of the most important meetings for my career because for the first time I was surrounded by other plant lipid biochemists. At all other meetings that I attended, such as the American Society of Plant Biology, only a few people attended sessions on lipids. In fact, I had the best discussions during my career at the Neuchâtel meeting, I met many of the people whose papers I had read, and I have attended every ISPL meeting since that time. I particularly remember meeting the European colleagues, such as Sten Stymne, Penny von Wettstein-Knowles, Hartmut Lichtenthaler, Ernst Heinz, John Browse, Toni Slabas, and many others whose work I admired”.

This ISPL-induced development also promoted the exchange of young colleagues who could learn or introduce new technologies to another European laboratory. In addition, at the following ISPL two years later all participants of the previous ISPL wanted to come up with further progress as well as completely new scientific results and approaches in order to show their colleagues and friends their scientific knowledge and competence. Thus, cooperation and competition between the European plant lipid research groups was greatly stimulated, and fast progress was made in our knowledge on biosynthesis, function and interaction of plant lipids. Part of this success was due to the fact, that the proceedings books were soon published after the symposia and that, starting with the 3rd ISPL in Göteborg in 1978, the oral contributions of all participants were included in the proceedings books. Four of the proceedings books of the ISPL from 1978 to 1984 appeared with Elsevier Science Publishers, which also published books on general and animal lipids. The Elsevier contact partner, who had always participated in the ISPL collecting the manuscripts, noticed the increasing progress the plant lipid scientists had made. Then at the 6th ISPL in Neuchâtel in 1984 he informed us that, despite originally being clearly behind the animal lipid research, the plant lipid scientists were now leading and trendsetters in many topics of general lipid biochemistry.

Continuation of the International Symposia on Plant Lipids

In Norwich and Karlsruhe the participants from the different countries pleaded for a regular continuation of these plant lipid symposia, and *an international group of senior scientists* with members of various countries discussed this in detail. The decision was to hold these international symposia on plant lipids, the ISPL, every two years. The Swedish colleagues Conny Liljenberg, Lars-Åke Appelqvist, and Eva Selstam proposed to organize the 3rd ISPL in Göteborg in 1978. Paul Mazliak, with the support of Roland Douce and Pierre Benveniste, was ready to organize the 4th International Symposium on Plant Lipids in Paris in 1980. Afterwards the Dutch colleagues around J.F.G.M. Wintermans and P.J.C. Kuiper as well as others thought of possibly holding one of the future ISPL. And the international steering board of senior lipid scientists (see below Chapter 6) agreed to proceed in this sequence. It was also agreed that future organizers should very early signalize their readiness to organize one of the ISPL so it could be decided not only two but even four years ahead on the subsequent organizers. This was found particularly useful to give an organizer enough time to raise funds and to prepare the symposium. Also several basic principles of the Norwich and Karlsruhe ISPL, such as *a reduced fee for students, a joint symposium dinner, an excursion* on one afternoon and *special evening events* including a reception were found very stimulating and were recommended to integrate in future ISPL.

The European Character of the ISPL

At the beginning these international symposia on plant lipids were thought to be *European symposia with international participation* in order to stimulate plant lipid research in Europe and to provide the European colleagues with a forum where they could discuss and exchange their results. Certain European countries and their rather modest national societies, were just too small to provide such a discussion forum for their few plant lipid scientists, this could only be done on a European level. Various of the European senior scientists had been participants of meetings of the ASPP in the USA and knew the benefit of a larger discussion forum. Thus, the international advisory board of senior plant lipid scientists and group leaders that was dominated by the European plant lipid researchers, propagated that the ISPLs were “International European Symposia” that should primarily be held in Europe. The colleagues from overseas (USA, Canada) agreed. This was similar to the international Photosynthesis Congresses initiated by Helmut Metzner in Europe with the 1968 Freudenstadt Congress, which were considered to be primarily a forum for the photosynthesis researchers of Europe and open to strong international participation from overseas. An equivalent of the ASPP as a European organization, e. g. the Federation of European Societies of Plant Physiology, FESPP, did not exist at that time, the latter was founded in 1978, i.e. clearly after the start of the ISPL (see Lichtenthaler 2004). Later it turned out that even within the FESPP Congresses there was little space or echo for special plant lipid sessions, one major reason being that the plant biochemists (and in fact many plant lipid researchers were biochemists) did not participate in the FESPP Congresses of plant physiologists. Also, the US colleagues in plant lipid research, biochemists and plant physiologists, did not find a proper forum within their ASPP and therefore started a separate series of biannual glycerolipid meetings in 1993 (see below National Plant Lipid Cooperative, Chapter 8). The great success of the first six ISPLs showed that it had been an excellent idea to establish these European plant lipid symposia with international participation.

The Decisions for the Location of Future ISPL

This European character of the ISPL always came up at the meetings of the international advisory board of senior plant lipid scientists (see below: Chapter 6 on the function of this

board), when, on the basis of a new proposal, another European laboratory and country was selected for the organization of the next ISPL. Thus, after the first two ISPL in England and Germany the next ones were held in Sweden, France, the Netherlands, and Switzerland. In view of the regular contributions of our US colleagues it became clear that the ISPL could not always be held exclusively in Europe, where they were badly needed to stimulate communication between the lipid scientists of the many small European countries. Thus, the international board decided unanimously to hold the 7th ISPL in the USA. This was done with pleasure to honor Paul Stumpf's great achievements in plant lipid biochemistry (see e.g. Stumpf 1987) and in the activation of international cooperation. However, due to the high airfare costs from Europe to Davis/California, only the group leaders and senior scientists of the many European plant lipid laboratories could afford to participate in the ISPL in the USA. Yet, at the same time this was a chance for a large number of American colleagues to take part in this ISPL. For this reason the total number of participants in the Davis ISPL in 1986 rose to more than 300, whereas in Europe usually 150 to 200 people had participated. The following ISPL were held again in Europe (Hungary and England as shown in Table 1), where once again it was possible for the young European researchers and Ph.D. students to participate. The decision to go to Tunisia with the 10th ISPL was made because the main organizer, Abdel Cherif, and his colleagues in Tunis were well-known members of the international plant lipid family. Adel Cherif had got his Ph.D. with Paul Mazliak (Paris) and he and his Tunisian co-organizers had spent one or more research stays in Paul Mazliak's laboratory. The tourist island of Djerba was chosen as the location for that ISPL because most of the European colleagues could make arrangements for direct and fairly inexpensive flights and accommodation. Thus, the ISPL in Djerba in 1992 was as easy and inexpensive to participate in as any ISPL in Europe.

The international board considered several times to hold one of the ISPL in Israel, following the proposals of Ya'acov Leshem (Ramat Gan), Zvi Cohen (Sde Boker) and other Israeli members of the international plant lipid family. However, due to the political instability and the assumed high security risks it was postponed for a later point in time. However, the offer of John P. Williams to hold the 12th ISPL in Toronto was approved although it was known that once again fewer European plant lipid scientists would be able to participate in comparison to an ISPL held in Europe. After two further ISPLs in Europe, Sevilla (1998) and Cardiff (2000), the 15th ISPL took place in Japan for the first time. The international advisory board made that decision in order to acknowledge the great contributions of our Japanese plant lipid scientists, such as Mitsu Yamada (Tokyo), Norio Murata (Okazaki), and various others to the progress in plant lipid research. The 16th ISPL had to be held again in Europe and was held in 2004 once more in Budapest by Peter Biacs.

On the proposal of Christoph Benning, supported by John Ohlrogge and other US colleagues, the 17th ISPL will be held again in the USA (see Table 1). Thus, these initially exclusively "European ISPL" have become truly international symposia on plant lipids. There are further offers to hold one of the coming ISPL in France, Sweden, and Australia. In view of the fact that these ISPL started as "European international symposia", most European plant lipid scientists favour the idea to possibly hold every second ISPL in Europe.

Dedication of the ISPL-Proceedings Books

The first two proceedings books of the ISPL 1974 and 1976 contained only the contributions of the plenary lectures. Starting with the third ISPL in Göteborg in 1978 the proceedings books became more comprehensive by including also the content of short contributions and of various posters. At the 1980 ISPL in Paris, Hartmut Lichtenthaler proposed to dedicate the proceedings book of the 4th ISPL to Sjef Wintermans, on the occasion of his approaching 60th

birthday, for his great merits in the early plant lipid research. Paul Mazliak (Paris), then organizer and editor of the proceedings book, took up this idea and the international board of senior plant scientists agreed to dedicate the future proceedings books to a meritorious plant lipid scientist. So far the choice to whom the books would be dedicated has always been made by the ISPL organizers and editors of the corresponding proceedings book. The colleagues that were chosen were well-known for their contributions to plant lipid biochemistry and physiology, usually colleagues who had participated in several ISPLs. After Wintermans the next dedications were made to Paul Stumpf, Morris Kates, and Andrew Benson. These and all the further are listed in Table 3. “It is a great honor when your colleagues and friends dedicate a proceedings book to you”, responded one of the recipients. In 1994 the eighth dedication was made post-mortem to Terry Galliard, the founder of the ISPL series, who had passed away much too early.

5) THE TERRY GALLIARD MEMORIAL LECTURE AND MEDAL

The lecture: On 31st March 1993, Professor Terry Galliard, the organizer of the first ISPL in Norwich in 1974, passed away at the age of 53 years after a brave fight against an illness that had been diagnosed two years earlier. The chemist T. Galliard had received his Ph.D. in 1963 at the Medical Biochemistry Department, University of Birmingham. From 1964 through 1966 he spent two of his postdoc years with Paul Stumpf in Davis/California. His very early death was a great loss for his friends of the international plant lipid family. Jean-Claude Kader who, in the early 1980s had spent two years as a postdoc in Terry Galliard’s laboratory, was particularly shocked. At that time J.-C. Kader was the organizer of the 11th ISPL in Paris in 1994. He decided to hold a Terry Galliard Memorial Lecture, a scientific lecture of a renowned colleague to be given at the opening of the 11th ISPL. He nominated Norio Murata to give this memorial lecture. The international board of plant lipid scientists agreed to continue with these T. Galliard lectures on all future ISPL. Organizers make a proposal and select, usually in cooperation with the international board of plant lipids scientists, the T. Galliard lecturer. So far six Terry Galliard lectures have been held, the names and lecture titles are shown in Table 5. Practically all T. Galliard lecturers were members of the plant lipid family and had participated in several of the ISPL.

Table 5. Names of the Terry Galliard Medal Lecturers on the international symposia on plant lipids and the titles of their lecture.

Year	Lecturer & Title
1994	Norio Murata (Okazaki) The cyanobacterial desaturases: aspects of their structure and regulation.
1996	John Shanklin (Upton, NY) Structure-function studies on desaturases and related hydrocarbon hydroxylases.
1998	John L. Harwood (Cardiff) Life and stress: a plant’s standpoint.
2000	John Ohlrogge (East Lansing) Fatty acid synthesis: from CO ₂ to functional genomics.
2002	Ernst Heinz (Hamburg) Sterol glucosides and ceramide glucosides: cloning of enzymes contributing to their biosynthesis.
2004	Hartmut Lichtenthaler (Karlsruhe) Evolution of carotenoid and isoprenoid lipid biosynthesis in photosynthetic and

non-photosynthetic organisms.

The Terry Galliard Medal: Later, another addition was made to this tradition. John Harwood, a close personal friend of Terry Galliard and a regular participant in all ISPLs, had the idea to provide a Terry Galliard Medal to each of the T. Galliard lecturers. He started this tradition in 2000 when he organized the 14th ISPL in Cardiff. The medal shows the face of Terry with the text “TERRY GALLIARD MEDAL” on one side and “PLANT LIPID BIOCHEMISTRY” on the reverse where, additionally, the name of the lecturer is engraved, see Fig. 1 for the last medal given in 2004. The first T. Galliard medals were conferred on the ISPL 2000 in Cardiff in presence of his widow Annona and his son Ian Galliard (Fig.2). The next T. Galliard lecturers are shown in Fig. 3. The honor to give the T. Galliard medal lecture is reserved for meritorious colleagues in plant lipid biochemistry.



Fig. 1. Terry-Galliard-Medal for Plant Lipid Biochemistry, which is conferred to those plant lipid scientists who give the Terry Galliard Lecture.

6) THE ORGANIZATION OF THE ISPL BY THE INTERNATIONAL BOARD

The International Board of Plant Lipid Scientists

At the first ISPL in Norwich 1974 some of the participating plant lipid scientists started to talk about a future international symposium on plant lipids and decided for another meeting in Karlsruhe in 1976. At the 2nd ISPL in Karlsruhe this group of senior scientists and leaders of research groups of different European countries as well as the USA came together now forming an unofficial international board of plant lipid scientists. They discussed the proposals for future plant lipid symposia and finally decided on the place and organizer of the next two ISPL in Göteborg in 1978 and in Paris in 1980. The concern of this international advisory and steering board was to make symposia available with a low registration fee and inexpensive accommodation as well as to hold them at the right place and time in order to make sure that many young co-workers and Ph.D. students would have the chance to participate. They agreed that there should be a lower registration fee for Ph.D. students, and if possible student dormitories should be available for students and lipid scientists alike.

All proposals for future topics and developments have been made in this board. Members of this advisory board are usually one or two colleagues representing a larger country and only

one for a smaller country. Yet, also the former organizers belong to this steering board as well as several colleagues from the country running the future ISPL. The organizers invite these



Fig. 2. The first four Terry Galliard lecturers on the 14th International Plant Lipid Symposium in Cardiff, July 2000, where they received the Terry Galliard Medal, here with Terry's widow and his son. From left to right: John Shanklin (Toronto 1996), Norio Murata (Paris 1994), Ian Galliard, Annona Galliard, John Harwood (Sevilla 1998) and John Ohlrogge (Cardiff 2000).



Fig. 3. The fifth and sixth Terry Galliard lecturers Ernst Heinz (left, Okazaki 2002, here on a photo from 1993) and Hartmut Lichtenthaler (right, Budapest 2004 during his lecture).

board members during the ISPL to an unofficial round table one evening or during lunch. On the 6th ISPL in Neuchâtel Paul-André Siegenthaler had invited the international advisory board of lipid colleagues to his beautiful house and garden above Lake Neuchâtel where we spent a wonderful summer evening and unanimously accepted the offer of Paul Stumpf to hold the 7th ISPL in Davis/California. We never had very stringent rules on the number of persons in the board discussion but we tried to keep it small. The board members would then communicate the essentials of the discussion to the colleagues in their country. In addition, the decision was made public in the final discussion round of the running ISPL and/or at the evening banquet. At the Karlsruhe ISPL in 1976 the following colleagues participated in the international board discussion: Terry Galliard and John Harwood (both UK), Paul Mazliak and Roland Douce (both France), Conny Liljenberg and Eva Selstam (future organizers for Sweden), J. Wintermans and P. Kuiper (Netherlands), John Williams (Toronto), Paul Stumpf (USA), W. Eichenberger (Switzerland), Penny von Wettstein-Knowles (Denmark) as well as the German organizers H.K. Lichtenthaler, M. Tevini, E. Heinz and H.K. Mangold.

The Independence of the International Advisory Board of Plant Lipid Scientists

Since its founding in 1974 (Norwich) and 1976 (Karlsruhe) the international steering board of plant lipid scientists representing the whole international plant lipid family remained independent and free of any scientific organizational structure or society. There were several attempts to incorporate our very successful plant lipid family into the frame of a society organization. This was particularly strong during the 1984 ISPL in the USA where a large chemical parent organization offered us to become a member under their guidance. This would, however, have meant that we had to pay a regular annual membership fee, had to follow the statutes of that society-type organization and were no longer free to decide where, when and by whom the next symposium was held, etc. The only advantage would have been to obtain organizational help from them for future ISPL and the availability of addresses.

An international scientific group like the plant lipid family, however, performs interdisciplinary research and comprises biochemists, plant physiologists, organic and structural chemists, molecular biologists and electron microscopists as members from many countries. Such an open international science group cannot be pressed into the frame of a national scientific society or of one professional organization, such as biochemists or plant physiologists. In fact, the ongoing great success of the international family of plant lipid scientists is due to its freedom of decision-making in all topics, its openness for everybody, i.e. for new members, and those who might perform plant lipid research for a limited number of years and others who are involved in continuous plant lipid research. Independent of any administrative obligations everybody can be a member as long as he is involved in plant lipid research. This also means that each new organizer of an ISPL can bring in his own ideas and impetus. For these reasons, the international advisory board of the ISPL remained independent and should continue to remain independent in the future. The list of participants is always passed from one organizer to the other in order to facilitate the flow of information and to reach all members of the international plant lipid family.

Parallel Sessions or only one Oral Session for Everybody?

For the first seven ISPL we had only one oral session for all the participants. Thus, all lipid scientists and Ph.D. students were in the same lecture hall and everybody listened to the main lectures and short oral contributions regardless if the session topic dealt with biosynthesis or function of sterols, prenylipids, waxes, fatty acids or particular plant acyl lipids. It turned out

to be very useful to learn from colleagues of the different plant lipid research areas, to integrate them in the international plant lipid family and to sensitize them to new research approaches and techniques of a certain plant lipid field that could also be applied to other fields of plant lipid research. Holding only one oral session enormously stimulated the scientific discussion, gave rise to cooperation and provided fast progress. With the increasing number of participants not everybody could give an oral presentation, therefore, at the 3rd ISPL in Göteborg in 1978 and the following ISPL, poster presentations including poster discussions at special hours were added to the oral sessions.

At the 8th ISPL in Budapest in 1986 an attempt was made to have *two parallel sessions* held on two different floors of the symposium building. This had been done in order to increase the number of oral presentations and to reduce the number of posters. This was, however, a very negative experience since one session was overcrowded, whereas the speaker in the parallel session had only a few listeners. Moreover, a specialist in one field, who was expected to be in the particular session of his field, might be found in the other session because he worked in the other field as well or wanted to extend his knowledge and learn a new technique or approach for his further research. Thus, many speakers did not get the proper feedback on their research. This attempt also showed that a fast move from one session to the other for one presentation and back to the first one never works well, since the time schedule of oral presentations including discussion can never be completely adhered to. Depending on the relevance and topical interest of a presentation a shorter or longer discussion may take place. Based on this rather negative experience the international advisory board decided to have only one oral session per future ISPL. It is better to limit the number of speakers and increase the number of posters than having parallel sessions. Since the 9th ISPL the organizers strictly followed these guidelines, and this is strongly recommended also for the future ISPL.

Number of Speakers and Participants in the ISPLs

Whereas the first ISPL in Norwich assembled ca. 25 plant lipid scientists from seven countries (and many others that followed the 12 lectures), 140 plant lipid scientists and Ph.D. students from 14 countries participated in the 2nd ISPL in Karlsruhe in 1976 with 57 oral contributions (no posters). The 3rd ISPL had a participation of 130 scientists from 17 countries with 61 contributions. In Groningen in 1982 (5th ISPL) the number of participants had increased to 160 with 109 papers (oral presentations and posters), as shown in the proceedings book. On the 11th ISPL in Paris in 1994 there were 285 lipid scientists from 26 countries with 54 lectures and 165 posters, and 161 contributions were selected for the proceedings book. 225 plant lipid colleagues from 29 countries participated in the 15th ISPL in Japan in 2002 with 68 lectures and 93 posters. Thus, the number of plant lipid scientists including Ph.D. students has steadily been increasing from symposium to symposium and so has the duration of the ISPL. At the first five ISPL there were three actual lecturing days, whereas the number of days has increased to five days for the most recent seven or eight ISPL. The high number of Ph.D. students and young plant lipid scientists at the 16th ISPL in Budapest in 2004 is a very positive sign for the continuity of the ISPL and the international plant lipid family, also in the years to come. In fact, there exist many open scientific questions in the field of biochemistry and physiology of plant lipids and new questions are arising with each progress. Thus, a great deal of research has to be performed, and plant lipid biochemistry will remain an attractive field of science for young colleagues.

7) THE GERMAN-SPEAKING PLANT LIPID WORKSHOPS (Arbeitstagungen Pflanzliche Lipide)

At the 2nd ISPL in Karlsruhe in 1976 the German plant lipid scientists decided to hold, in those years in between the international lipid symposia, biannual meetings on plant lipid research that became known as the “**Arbeitstagungen Pflanzliche Lipide**”, the Plant Lipid Workshops. These meetings were organized at different universities in Germany and once in Switzerland (see Table 6). Speakers at these workshops were always established plant lipid researchers, but primarily young scientists, Ph.D. and diploma students who learned how to present their first scientific results. The topics were biosynthesis, physiology and function of all plant lipids including prenylipids, sterols, waxes etc., the same as in the ISPL. The German-speaking colleagues from the Netherlands also participated in these meetings, e.g. J.F.G.M. Wintermans, and Waldemar Eichenberger and other colleagues from Switzerland.

These workshops originally lasted for one day and were later extended to two and sometimes three days (Table 6). The number of participants was initially around 40 but then increased to 50 to 70 persons. Each organizer took the right to invite a few foreign colleagues to give review lectures on special topics. In 1993, at the 9th German plant lipid workshop in Karlsruhe, 85 persons participated with Trevor Goodwin (Liverpool), Paul Mazliak (Paris) and Waldemar Eichenberger (Bern) as guest speakers. Guy Ourisson (Strasbourg) had been invited, too, had to cancel the last minute, but sent his review manuscript. Of all the presentations 31 (including 10 reviews) were submitted as manuscripts, reviewed and published as a special double issue “Plant Lipids” of the Journal of Plant Physiology with Andrea Golz and Hartmut Lichtenthaler (1994) as guest editors (J. Plant Physiology, Vol. 143, issues 4 and 5, 397-580, 1994). Among them the review papers Mazliak 1994, Ourisson 1994, Goodwin 1994, Schorr et al. 1994 and Golz et al. 1994 have been of high and lasting interest.

Later some of the German colleagues participating in these workshops obtained grants by the German Ministry of Research, BMBF, for particular research on plant lipids and new oil plants. Their research within this program was presented at the meetings of the German Society for Fat Research DGF. Initially, the meetings of the DGF were held separately from and usually before the biannual workshops of the Plant Lipid Group. Because the topics were overlapping and those colleagues did not want to present their data twice, it was decided in 1997 to hold the DGF meetings together with the workshops of the Plant Lipid Group. In 2002 the German Society for Fat Research (DGF) in Frankfurt/Main, formed a larger European unit by cooperating or merging with similar societies in France, Great Britain and the Netherlands. In the meantime it has expanded its European membership to an even larger number of countries. It changed its name to Euro Fed Lipid which stands for “European Federation for the Science and Technology of Lipids”. The reason for the foundation was the realization that the national societies of each individual European country were too small to survive in the future. Based on this new structure, the former workshops of the German Plant Lipid Group are now held by Euro Fed Lipid as the “European Symposia on Plant Lipids”, ESPL. The first ESPL took place in Aachen, Germany, in 2003 (Table 6), with Margit Frentzen as the organizer who had participated in the German plant lipid workshops and in most of the international ISPL. This 1st ESPL had 132 participants from 25 countries. The 2nd ESPL will be organized by Penny von Wettstein-Knowles, Copenhagen, who has been a regular participant in the international symposia on plant lipids since the 2nd ISPL in Karlsruhe in 1976.

Table 6. List of **German language plant lipid meetings** (*Arbeitstagungen Pflanzliche Lipide*) that started in 1977, one year after the 2nd International Symposium on Plant Lipids (ISPL) in Karlsruhe in 1976. These plant lipid workshops of the Plant Lipid Group for the young, German speaking scientists and Ph.D. students were always held in the years between the international ISPL and took place at different German universities and once also in Switzerland. Various Swiss and Dutch colleagues participated regularly in these meetings of the Plant Lipid Group, and on special occasions also colleagues from France, England and the USA.

Year	University	Organizer
1977	Mainz	Elmar Hartmann
1979	Köln	Ernst Heinz
1981	Ulm	Armin R. Gemrich
1983	Münster	Friedrich Spener
1985	Freiburg	Hans Kleinig
1987	Hannover	Gernot Schulz
1989	Göttingen	Klaus-Peter Heise
1991 (Sept. 10-13)	Wuppertal	Roland R. Theimer
1993 (Sept. 5 – 8)	Karlsruhe	Hartmut K. Lichtenthaler & Wilhelm Boland
1995 (Sept. 3 – 6)	Bern	Waldemar Eichenberger

From 1997 to 2001 the meetings of the Plant Lipid Group were held together with the German Society for Fat Research DGF:

1997 (Oct. 6 –8)	Bonn	Wilhelm Boland
1999 (May 31-June 2)	Göttingen	R. Töpfer, W. Friedt, F. Spener
2001 (July 15-18)	Meisdorf	Ivo Feussner

Since 2003 the meetings of the German language Plant Lipid Group are held in English as European Symposia on Plant Lipids, organized by Euro Fed Lipid, and will take place in different European countries:

2003 (Sept. 10-13)	Aachen	Margit Frentzen (1 st European Symposium on Plant Lipids)
2005 (Aug. 17-20)	Copenhagen	Penny von Wettstein-Knowles (2 nd European Symposium on Plant Lipids)

8) THE MEETINGS OF THE NATIONAL PLANT LIPID COOPERATIVE NPLC

Two American colleagues, Jan Jaworski and John Ohlrogge, who regularly participated in the International Symposia on Plant Lipids, ISPL, held in Europe most of the time, started their own series of **meetings on plant glycerolipids** in the USA. These biannual meetings of the National Plant Lipid Cooperative, held in between the international ISPL, started in 1993. The first one was held in Minneapolis as a “satellite” meeting associated with the American Society of Plant Biology's (ASPB) annual meeting. All other meetings have been held in early June at Fallen Leaf Lake near South Lake Tahoe at the “Sierra Camp” which is a beautiful

mountain resort facility of the Stanford University Alumni, termed Stanford Sierra Conference Center (see Table 7).

John Ohlrogge recalls: “We began these meetings in part because not so many North Americans could afford to attend the international meetings in Europe. We originally had 5 years of funding from a grant for Cooperative Research in Plant Biology. This funding allowed us to pay part of the expenses of students and postdocs to attend the meeting. I have always regretted that we used the term “national” in our organization. This term was used only because the grant which we first wrote emphasized funding for US collaborations, and because the granting agencies did not like the idea of sending US tax dollars outside the US. We have tried to emphasize that our meetings are open to anyone and we always invite speakers from outside the U.S.”

Table 7. US American biannual meetings on plant glycerolipids organized by the National Plant Lipid Cooperative NPLC and now held at the Sierra Camp in California (CA).

Year	Location	Organizers
1993 (July 29-31)	Minneapolis	Jan Jaworski, John Ohlrogge
1995 (June 1- 4)	Sierra Camp, Lake Tahoe, CA	Jan Jaworski, John Ohlrogge
1997 (June 4-8)	Sierra Camp, Lake Tahoe, CA	Jan Jaworski, John Ohlrogge
1999 (June 9-13)	Sierra Camp, Lake Tahoe, CA	Jan Jaworski, John Ohlrogge
2001 (June 6-10)	Sierra Camp, Lake Tahoe, CA	Jan Jaworski, John Ohlrogge
2003 (June 4-8)	Sierra Camp, Lake Tahoe, CA	Jan Jaworski, John Ohlrogge

The focus of these NPLC meetings has always been on glycerolipids, rather than the broader topics covered in the International ISPL meetings. Attendance is limited to 125 participants by the facility and has been between 100-120 over the past several meetings. Since 1998 there has no longer been any official grant support. Therefore, J. Jaworski and J. Ohlrogge have raised a small amount of money from private industry sponsors to support the meetings. Jan Jaworski has taken the major role in the organization of the meetings. Both organizers also appointed a program committee to choose speakers, etc. Participants at these NPLC meetings are the US colleagues and their students including foreign guests. Usually nine lectures are given at each of the three morning sessions, followed by poster-viewing, a free afternoon and after dinner a plenary lecture at 8:00 P.M. In 2003 the opening presentation was given by Andy A. Benson (San Diego), and John Harwood (Cardiff, U.K.) participated as a foreign guest speaker.

9) THE ANNUAL SYMPOSIA OF THE JAPANESE ASSOCIATION OF PLANT LIPID RESEARCHERS (JAPLR)

The international symposia on plant lipids, the ISPL, with their stimulating role for discussion, cooperation and future research on plant lipids gave also rise to an own series of plant lipid meetings in Japan. The Japanese colleagues Mitsu Yamada and Norio Murata, who had participated in several of the international ISPL created in 1988 this Japanese plant lipid symposia series which is held at Japanese universities or research institutions as shown in Table 8. Usually 50 to 60 persons participate in these symposia and sometimes also a few more. Norio Murata writes about the origin of the Japanese Symposia on Plant Lipids:

“In 1986, some leading Japanese plant lipid researchers including Norio Murata, Jiro Sekiya, Mikio Tada, Mitsu Yamada discussed the necessity of having a series of annual scientific meetings on plant lipids. This was because, although they had annual meetings held by the Japanese Conference on the Biochemistry of Lipids (JCBL), these meetings were strongly orientated toward lipid researches on human disease and animal science, and the number of presentations by plant lipid researchers was decreasing year to year. Accordingly, a decision was made to initiate a series of plant lipid symposia, which has continued to have the 17th meeting in November 2004. In the past symposia, we sometimes invited plant lipid researchers from abroad and also domestic animal and yeast lipid researchers. In the former case, English was used as the official language. In 1998, Mitsu Yamada and other leading plant lipid researchers also discussed the necessity of an official organization unifying plant lipid researches and the eligibility of members and secretaries for the proposed organization. Eventually, the Japanese Association of Plant Lipid Researchers (JAPLR) was established in 1999. The first president was Professor Mitsu Yamada (1999-2003) and the second is Professor Norio Murata (2004-present).”

Table 8. The annual symposia of the Japanese Association of Plant Lipid Researchers (JAPLR).

No.	Year	Date	University / Institute (City)	Organizer
1	1988	15. Jan	Okayama University (Okayama)	J. Sekiya and M. Tada
2	1989	9-10. Jan	NIBB (Okazaki)	A. Kawaguchi and N. Murata
3	1990	17-18. Jan	NIBB (Okazaki)	M. Yamada
4	1991	27. Mar	Kyoto Prefectural University (Kyoto)	K. Ichihara
5	1991	9-10. Dec	Tsukuba Bioscience Center (Tsukuba)	K. Kasamo
6	1993	16-17. Jul	University of Tokyo (Tokyo)	A. Kawaguchi
7	1994	18-19. Sep	Hokkaido Tokai University (Sapporo)	M. Yamada, H. Okuyama, G. Sakaki
8	1995	8-9. Sep	Kinki University (Nara)	O. Hirayama
9	1996	29-30. Nov	Kyoto University (Kyoto)	S. Shimizu
10	1997	29-30. Nov	Kyushu University (Fukuoka)	H. Wada
11	1998	27-28. Nov	University Tokyo (Tokyo)	I. Nishida
12	1999	26-27. Nov	NIBB (Okazaki)	N. Murata and K. Mikami
13	2000	24-25. Nov	Nagoya University (Nagoya)	Y. Sasaki
14	2001	30. Nov-12. Dec	NIBB (Okazaki)	N. Murata
15	2002	29-30. Nov	Tokyo Inst. of Technol. (Yokohama)	K. Takamiya and H. Ohta
16	2003	28-29. Nov	Yamaguchi University (Yamaguchi)	K. Matsui
17	2004	26-27. Nov	NAIST (Tsukuba)	Y. Kamisaka

Acknowledgements: I would like to thank various colleagues and friends of the international plant lipid family, such as Andy A. Benson (San Diego), Peter Biacs (Budapest), Waldemar Eichenberger (Bern), Margit Frentzen (Aachen), Ernst Heinz (Hamburg), Jean-Claude Kader (Paris), Conny Liljenberg (Göteborg), Norio Murata (Okazaki), John Ohlrogge (East Lansing), Paul-André Siegenthaler (Neuchâtel), Fritz Spener (Münster), and Sjeff Wintermans (Nijmegen) for valuable information, and in particular John Harwood (Cardiff) for his details on the first international symposium on plant lipids in Norwich as well as Frank Amoneit (Frankfurt) for information on the European Federation for the Science and Technology of Lipids.

10) REFERENCES

- Benson, A.A. (1976). Lipids in Plants (Book Review). *Phytochemistry* 15, 45.
- Benson, A.A., Daniel H. and Wiser R. (1959a). A sulfolipid in plants. *Proc. Natl. Acad. Sci. USA* 45, 1582-1587.
- Benson, A.A., Wintermans, J.F.G.M. and Wiser, R. (1959b). Chloroplast lipids as carbohydrate reservoirs. *Plant Physiol.* 34, 315-317.
- Douce, R. (1974). Site of synthesis of galactolipids in spinach chloroplasts. *Science* 183: 852-853.
- Douce, R., Holtz R.B. and Benson A.A. (1973). Isolation and properties of the envelope of spinach chloroplasts. *J. Biol. Chem.* 248: 7215-7222.
- Eichenberger, W. and Menke, W. (1966). Sterole in Blättern und Chloroplasten, *Z. Naturforschg* 21b: 859-867.
- Eichenberger, W. and Newman, D.W. (1968). Hexose transfer from UDP-hexose in the formation of steryl glycosides and esterified steryl glycosides. *Biochem. Biophys. Res. Commun.* 32: 366-374.
- Golz, A. and Lichtenthaler, H.K., eds. (1994). Recent advances in plant lipid research. Special issue of *J. Plant Physiol.* 143, 397- 580.
- Golz, A., Focke, M. and Lichtenthaler, H.K. (1994). Inhibitors of de novo fatty acid biosynthesis in higher plants. *J. Plant Physiol.* 143, 426- 433.
- Goodwin, T.W. (1994). Plant carotenoid research 1945-1985. *J. Plant Physiol.* 143, 440- 443.
- Hemskerk, J.W.M., Wintermans, J.F.G.M., Joyard, J., Bloch, M.A., Dorne, A.-J. and Douce, R. (1986). Localization of galactolipid: galactolipid galactosyl transferases in outer envelope membrane of spinach chloroplasts. *Biochim. Biophys. Acta* 877: 281-289.
- Lichtenthaler, H. K. (1968). Plastoglobuli and the fine structure of plastids. *Endeavour*, Vol. XXVII, 144-149.
- Lichtenthaler, H. K. Localization and functional concentrations of lipoquinones in chloroplasts. *Photosynth. Research*, Vol. I, H. Metzner (ed.), pp. 304-314, Tübingen 1969.
- Lichtenthaler, H.K. (2004). A history of the Federation of European Societies of Plant Physiology FESPP since its foundation in 1978 – including notes on the renaming as the Federation of European Societies of Plant Biology (FESPB) in 2002. *J. Plant Physiol.* 161, 635-639.
- Lichtenthaler, H. K., and Park, R. B. (1963). Chemical composition of chloroplast lamellae from spinach. *Nature* 198, 1070-1072.
- Lichtenthaler, H. K. and Calvin, M. (1964). Quinone and pigment composition of chloroplasts and quantasome aggregates from *Spinacia oleracea*. *Biochim. Biophys. Acta* 79, 30-40.
- Lichtenthaler, H. K., Prenzel, U., Douce, R. and Joyard, J. (1981). Localization of prenylquinones in the envelope of spinach chloroplasts. *Biochim. Biophys. Acta* 641, 99-105.

- Lichtenthaler, H. K., Meier, D., Retzlaff, G. and Hamm, R. (1982). Distribution and effects of bentazon in crop plants and weeds. *Z. Naturforsch.* 37c, 889-897.
- Mazliak, P. (1994). Desaturation processes in fatty acid and acyl lipid biosynthesis. *J. Plant Physiol.* 143, 399- 406.
- Menke, W. (1938). Untersuchungen über das Protoplasma grüner Pflanzenzellen. I. Isolierung von Chloroplasten aus Spinatblättern. *Z. Physiol. Chem.* 257, 43-48.
- Menke, W. (1961). Über die Chloroplasten von *Anthoceros punctatus*. *Z. Naturforsch.* 16b, 344- 336.
- Menke, W. and Jacob, E. (1942). Untersuchungen über das Protoplasma grüner Pflanzenzellen IV. Die Lipoide der Spinatchloroplasten. *Z. Physiol. Chem.* 272, 227-231.
- Metzner, H. (ed.). *Photosynthesis Research, Volumes I, II and III*, Tübingen 1969.
- Ourisson, G. (1994). Peculiarities of sterol biosynthesis in plants. *J. Plant Physiol.* 143, 434-439.
- Schorr, R., Mittag M., Müller, G., and Schweizer E. (1994). Differential activities and intramolecular location of fatty acid synthase and 6-methylsalicylic acid synthase components. *J. Plant Physiol.* 143, 407- 415.
- Siegenthaler, P.-A. and Murata, N. (eds.). *Lipids in Photosynthesis, Structure, Function and Genetics (Advances in Photosynthesis Vol. 6)*, Kluwer Academic Publishers, Dordrecht 1998.
- Stumpf, P.K. (ed.). *The Biochemistry of Plants, Vol. 9, Lipids: Structure and Function*, Academic Press, New York 1987.
- Van Besouw, A. and Wiermans J.F.G.M. (1978). Galactolipid formation in chloroplast envelopes. I. Evidence for two mechanisms in galactosylation. *Biochem. Biophys. Acta* 529, 44- 53.
- Wiermans J.F.G.M. (1960). Concentration of phosphatides and glycolipids in leaves. *Biochem. Biophys. Acta* 44, 49-54.
- Wiermans J.F.G.M. Changes in Lipid components in isolated chloroplasts. In: Goodwin T.W. (ed.), *Biochemistry of Chloroplasts, Vol. I*, p. 115, Academic Press, New York. 1966.
- Wiermans J.F.G.M., Helmsing P.J., Polman B.J.J., van Gisbergen J., and Collard J. Galactolipid transformations and photochemical activities of spinach chloroplasts. In: Metzner H. (ed.), *Progress in Photosynthesis, Vol- I*, pp. 332-337, Tübingen 1969.

Origin of photos:

- Figs. 1 and 3: from Hartmut Lichtenthaler, Karlsruhe
 Fig. 2: from John Harwood, Cardiff