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The Günther Laukien Prize

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Abstract

The Günther Laukien Prize, established in 1999, intends *to recognize recent cutting-edge experimental NMR research with a high probability of enabling beneficial new applications*. It is awarded yearly at the Experimental NMR Conference (ENC).

Keywords: Günther Laukien Prize

The Günther Laukien Prize was established in 1999 in memory of Professor Günther Laukien, Fig. 1, one of the pioneers in the field of nuclear magnetic resonance. The award intends *to recognize recent cutting-edge experimental NMR research with a high probability of enabling beneficial new applications*. It is awarded annually at the Experimental NMR Conference (ENC), and the prize receipient is chosen by an independent prize committee under the auspices of the ENC Executive Committee. It is financed by the company Bruker BioSpin and caries, at present, a monetary award of US $15,000. In the meantime, the NMR community has accepted the prize as one of the leading distinctions in the field.

Science prizes have gained considerable importance within the scientific community. And this is for several good reasons. Firstly, scientists rarely have a chance of becoming rich, let alone super rich, which appears to be the most outstanding current goal within affluent societies. It seems particularly fashionable to earn money without getting any dirt on one's own hands. The hard-working scientists are usually not part of the money-driven materialistic society; their primary motivation is curiosity. They are driven by the urge to gain fascinating new insights into nature and to develop skills for taking advantage of nature's opportunities. One might argue that the financially disfavoured scientific 'working classes' deserve prizes as motivating agents, even when, after all, these prizes will not be valid entry tickets into high-society.

A second reason for justifying science prizes is the need of promoting science within society. Prizes may draw public attention to the awarded domains, in a manner similar to highly paid sports events. The higher the honorarium of a champion, the higher is his or her general esteem. Today, a science career appears to provide per se not enough attraction for the youth. A better public recognition of science is essential for motivating more young people to decide for science studies; especially in the US, but also in Europe, there is a demand for more science majors. In addition, a more favourable public esteem for science is also needed for raising sufficient funds for maintaining a creative science community that is indispensable for safeguarding our global future.

The management of Bruker BioSpin has recognized a unique opportunity for satisfying both, a need of the NMR community, as well as the honourable recognition of its founder, the great scientist and entrepreneur, Günther Laukien.

Günther Laukien was born in 1924 in Eschringen in the Saarland of Germany. After finishing high school

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Fig. 1. Günther Laukien (1924–1997) and the HX 270 Supercon NMR spectrometer (photo taken at Bruker-Physik AG, Karlsruhe in 1973).

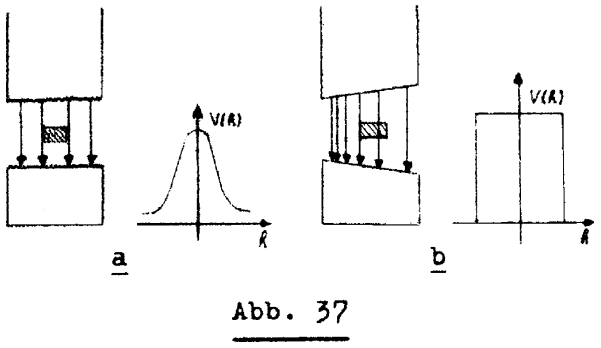

Fig. 2. The influence of an inhomogeneous magnetic field on the NMR signal shape, providing a means for exploring spatial magnetic field distributions (Fig. 37 of Ref. [1]).

in 1942, he had to serve in the German Navy as a submarine engineer until the end of the war in 1945. He then started a study in physics at the University of Tübingen where he gained his diploma in Physics in 1951. His graduate studies concluded in 1955 at the University of Stuttgart already on experimental aspects of nuclear magnetic resonance under the guidance of Professor Hans Otto Kneser.

Hans Otto Kneser, who was primarily interested in ultrasonic absorption for studying molecular motion in motion, seems to have left much freedom to Günther Laukien in his studies of magnetic resonance, the results of which he also published independently. Motivated by the dynamical interests of his thesis advisor, he concentrated on free precession techniques and on the measurement of nuclear spin relaxation times [1–3]. His PhD thesis, "Freie Präzession kernmagnetischer Momente" [1], is full of original thoughts on advanced pulse techniques and on echo signals, at a time when only few scientists where actively involved in free precession NMR techniques.

It is remarkable that he already explored the influence of magnetic field inhomogeneity on the shape of the free induction decay and echo signals. One may even suspect that he already was dreaming about imaging applications when he was drawing his Fig. 37 [1], reproduced in Fig. 2. He shows the different lineshapes in homogeneous and linearly inhomogeneous magnetic fields. He also writes the remarkable sentence "These examples show that the study of nuclear magnetic interferences is also an elegant means for exploring magnetic field distributions." [*Diese Beispiele zeigen, dass das Studium der Kernmomentinterferenzen auch ein elegantes Hilfsmittel zur Untersuchung magnetischer Feldverteilungen ist.*] [1]. It is very likely that he was not aware of the somewhat earlier related investigations by Gabillard [4,5] and Carr [6].

He rapidly advanced then to the position of an Oberassistent and gained the venia legendi for physics in 1957. During this period, he was writing his important 256-pages contribution to the *Handbuch der Physik* on *Kernmagnetische Hochfrequenz-Spektroskopie* [7]. This was one of the very first comprehensive treatises on NMR spectroscopy.

In 1958, Günther Laukien moved to the University of Karlsruhe where he was put in charge of the Institute for Experimental Physics and where he became Professor of Physics in 1960. In 1968, he finally joined the Ruhr-University Bochum as a Professor for Electronics with a lifetime appointment.

The enterprising spirit of Günther Laukien was not satisfied with his academic profession alone, and he started an innovative industrial career in parallel to his academic occupation. In 1960, he co-founded the company Bruker-Physik AG, Karlsruhe/Rheinstetten that specialized in the design and usage of electromagnets. It was only natural that he put his emphasis from the beginning on nuclear magnetic resonance which he knew so well and liked so much.

An important step forward was the foresighted acquisition of parts of the Swiss company Trüb-Täuber & Co., which was in dissolution in 1964. The NMR division of Trüb-Täuber & Co resulted from a fruitful interaction with the ETH Zürich at the end of 1950s. Professor Hans H. Günthard and Hans Primas were designing an advanced high-resolution NMR spectrometer, operating at a proton resonance frequency of 25 MHz [8–10], using a permanent magnet. This spectrometer was then commercialized by Dr. Lieni Wegmann within Trüb-Täuber [11] under the designation

KIS 25. The acquisition of the NMR division of Trüb-Täuber & Co by Günther Laukien led to the foundation of the highly successful company Spectrospin AG in Fällanden, Switzerland, which at that time, was the high-resolution NMR department of Bruker-Physik AG.

It is not the place here to recall the entire history of Bruker-Physik AG and the later renaming of the magnetic resonance business to Bruker BioSpin. However, it suffices to emphasize the guiding role, which Günther Laukien played until his death in 1997. True, the Bruker Company possessed highly skilled and ingenious coworkers, to mention by name only Dr. Tony Keller, but the responsibility and the final decisions were always carried by Günther Laukien.

Günther Laukien did not restrict his interests, his creativity, and his commercial activities to NMR. The entire field of magnetic resonance, from EPR, to magnetic resonance imaging (MRI), especially for animal studies, to geological magnetic resonance prospecting, which remained one of his dreams, belonged to 'his' territory. In addition, virtually any form of instrumental analysis profited from his novel ideas, and the Bruker group became actively involved with their implementation. Just to name a few, Günther Laukien and the Bruker Daltonics business became active in all forms of mass spectroscopy (MS), including Fourier transform ion cyclotron resonance MS, ion trap MS, time-of-flight MS instruments, and the development of mobile mass spectrometers for chemical defence and environmental safety purposes. Infrared and Raman spectroscopy, also in combination with microscopy, became prosperous fields within Bruker Optics. High performance liquid chromatography was developed in combination with mass spectroscopy as LC-MS and with NMR as LC-NMR. Finally, Bruker AXS provides advanced X-ray solutions where X-ray diffraction nicely complements NMR for biological structure determination. Günther Laukien had many further plans in his inventive head, and limits were set solely by the limited capacity of his company and by the finite duration of his own life. It was certainly very well justified to honour him with the ISMAR Prize in 1980 for his innovative entrepreneurship promoting the field of magnetic resonance. He shared the prize with the later Nobel Laureate Hans G. Dehmelt (1989).

Today, his sons Frank H. Laukien, Dirk D. Laukien, and Jörg C. Laukien continue his work in the same spirit and with the same enthusiasm. Many of the brilliant coworkers, on whom already Günther Laukien could rely, support them.

Günther Laukien would certainly be quite pleased to see his name associated with a Prize honouring the creativity of mostly younger scientists who continue to develop NMR even further. He was convinced that there are no limits for the potential of this powerful method, either in view of a profitable business or for beneficial applications. He was a positive thinker and a true entrepreneur.

The Laureates of the Günther Laukien Prize are selected from public nominations by a scientific committee consisting of the previous, the present, and the next Chair Person of the ENC organizing committee, supplemented, at present, by three former winners of the Günther Laukien Prize, and headed by a chairperson. Indeed, the list of the Günther Laukien Prize Laureates since 1999 is quite impressive:

1999: Konstantin Pervushin, Roland Riek, Gerhard Wider, and Kurt Wüthrich:

For their TROSY technique. By providing a means to detect only those resonances which are narrowed by the mutual interferences between dipole–dipole and chemical shift anisotropy relaxation, TROSY has dramatically extended the range of molar masses of the biomolecular structures which can be analysed by multidimensional NMR spectroscopy.

2000: Lucio Frydman:

For his ground-breaking work in high-resolution solid state NMR of quadrupolar nuclei by means of multiple quantum MAS spectroscopy.

2001: Klaas Paul Prüssmann, Markus Weiger, and Peter Bösiger:

For the conception of Sensitivity-Encoded Magnetic Resonance Imaging (SENSE)

2002: Ad Bax, Axel Bothner-By, and James H. Prestegard:

For the conception and development of techniques for the measurement of residual dipolar couplings of weakly aligned molecules in solution. The residual couplings are an important source of data for structural studies of biomolecules.

2003: Jacob Schaefer

For the conception of the REDOR technique (together with Terry Gullion) and for the numerous insightful applications of REDOR to synthetic polymers and bio-polymers, proving the enormous power of the method for elucidating non-crystalline solid materials.

2004: Lewis E. Kay

For his innovative contributions to NMR of biological macromolecules, particularly for the study of side-chain motion of proteins by deuterium resonance and correlated relaxation measurements, and for gradient-and-sensitivity-enhanced hetero-nuclear correlation spectroscopy.

Each of the citations refers to an instrumental or methodological innovation. It is not by chance that they all have been associated with simple acronyms, usually in the form of five-letter words: In 1999 the acronym was TOCSY, in 2000: MQMAS, in 2001: SENSE, in 2003: REDOR. Only in 2002 and 2004, the inventors provided no five-letter acronyms, and the chairman of the Laukien Prize Committee had to become inventive himself. PALMO (for partially aligned molecules, *Palmo* being a Tibetan deity of prosperity and beauty, related to the Hindu deity *Lakshmi*) was his suggestion for the usage of aligning agents in NMR. In the case of L.E.Kay's multiple contributions, it was difficult to find a single unifying term, leading to the suggestive usage of his own name per se as the fitting acronym: LEKAY. After all, this demonstrates, one more time, that in order to become famous, one has not only to make a great invention, but it is of advantage also to design a catchy term for it.

Obviously, the absence of catchy terms was no hindrance for the Committee to award the well-deserved Günther Laukien Prize 2004 to Lewis E. Kay. Surely, also the selection of future laureates will not be based on such superficial considerations. Innovative contributions to NMR methodology of all conceivable kinds will continue to be the decisive factors for the selection of laureates. So far, it has not been a problem to find deserving candidates, but the selection of the most outstanding among numerous emerging giants has caused regular bad headaches. Certainly, nuclear magnetic resonance will remain an exceptionally creative field for a long time to come, and many brilliant minds will have to be patient in waiting for their well-deserved prizes.

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