The Scientific and Technical Accomplishments of Gunther Laukien (Address to the joint ISMAR-AMPERE Conference, Delft, 1980 at the occasion of the awarding of the ISMAR Prize in Industrial Development)

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Three years ago at the last meeting in Banff, the ISMAR prize was awarded to Professor Zavoisky, a pioneer in the field, who has observed the very first magnetic resonance in 1944, i.e., electron paramagnetic resonance in paramagnetic ions. Shortly afterwards, nuclear magnetic resonance was discovered simultaneously by F. Bloch and E. M. Purcell, who received the Nobel Prize for this discovery. All three scientists were physicists, and I believe that this is symptomatic for new discoveries involving new techniques because physicists are used to building their own equipment adapted to a particular new experiment. Many techniques which have become important for chemists, biochemists and biologists were first developed by physicists. Magnetic resonance, in particular, became a very important method in many fields, probably the most important technique in modern analytical chemistry. Many investigations became possible only by the invention of magnetic resonance: let me mention the study of free radicals by electron spin resonance or the investigation of the structure of large molecules of interest in biochemistry and biology, which cannot be studied by x-ray crystallography because they cannot be crystallized.

Since not all chemists and biologists can build their own equipment, the wide general application of the new technique became only possible when equipment of high technical standard was commercially available, in the late fifties in the U.S.A. and in the sixties in Europe. However, such highly sophisticated equipment does not just happen to exist; it has to be designed and constructed by people and it requires a certain type of people who have a combination of the following abilities:

First, they must have an insight and understanding of the scientific problem in order to know what properties the equipment should have; secondly, they must have an understanding of the technical possibilities and should know what can be made. A good example of a person who had this insight into the scientific problem and also the technical understanding is the discoverer of NMR, F. Bloch, who has used his innovations to obtain patents for their practical applications.

Although this combination of abilities is not frequently found, the industrial development of high quality equipment requires a third talent in order to be successful in our economic system: it requires an insight into the commercial necessities and the ability to construct equipment which can be sold so that the income which is needed for new technical developments is secured.

If the combination of the first two abilities, to understand what is required and to know what can be done, is already not frequently found, the combination of these two with an additional understanding of the economic necessities is extremely rare. I believe that the success of

Bruker-Physik, which was founded in 1960 and has been developing in these 20 years to a world-wide renowned producer of equipment for all types of magnetic resonance and other techniques, is mainly due to the fact that the ISMAR prizewinner of today, Professor Laukien, possesses this very rare combination of abilities, and I do not know but assume that it was this combination of personal properties which induced the Selection Committee for the ISMAR prize of 1980 to award the prize to Professor Laukien.

An indication of this combination of talents and interests was his ability to combine a scientific university career with activities in technical industrial development, a phenomenon which is more frequently observed in the U.S.A., which, however, is still rare in most European countries. Laukien started out as a university scientist, obtained his diploma in physics in 1951 and his Ph.D. in 1955 at the University of Tübingen. Stimulated by the discovery of the spin echo phenomenon by E. L. Hahn, who was awarded the first ISMAR prize in 1971 in Israel, he became interested in magnetic resonance as early as 1951 and wrote a review article on NMR in the Encyclopedia of Physics which appeared in 1954. Soon after his 'Habilitation' in 1957 he was made responsible for the Institute of Physics of Karlsruhe's Technical University, following the sudden death of Professor Gerthsen. However, already in 1960 when he was nominated professor of physics he founded the (at that time) small firm of Bruker-Physik with the intention to produce equipment for the still new technique of magnetic resonance. In the following years he was the leading spirit and the initiator both technically and organizationally of many new developments of which I would like to mention the initiation of the partnership with the Swiss firm Spectrospin, the part which produced equipment for magnetic resonance from the former Trüb-Teubner AG.

All these activities did not prevent Professor Laukien from accepting a chair of electronics at the new University of Bochum. However, the following years showed that even a man with the great activity and working power of Laukien has his physical limitations. The double burden of being professor in Bochum and president of Bruker in Karlsruhe was too heavy in the long run. Realizing this, he decided in 1971 to concentrate on the further development of Bruker and asked to be freed from his active duties and responsibilities in Bochum, preserving the academic rights of a full professor.

It is not the time and the place here to go into details concerning the many technical innovations introduced by Laukien during the past 25 years, but let me mention just a few. Laukien recognised very early the importance of pulsed NMR and developed pulse spectrometers for the investigation of relaxation times from the beginning of Bruker-Physik. An increasing importance of studying T_1 and T_2 was emphasized by C . Slichter in his outlook for the future of NMR at the ISMAR meeting in 1974 in Bombay, a prediction which since then has proven to be correct and which has confirmed Laukien's earlier approach. Pulsed NMR has now penetrated high resolution NMR in the form of Fourier spectroscopy using the transformation of spectra from the time domain into the frequency domain by Fourier transformation, a technique which was already discussed by Laukien in the early fifties in the general article in the Encyclopedia of Physics mentioned above. Laukien recognized also the importance of high field NMR and pushed forward the development of super-conducting coils. Incidentally, he first proposed to embed the super-conducting material in an ordinary well-conducting metal, like copper or silver, a technique which is now generally adopted for super-conducting wire.

In the last decade Laukien has extended his activities into other fields of scientific research, industrial processes and quality control, being responsible for the development of magnetic systems for nuclear physics: development of instruments for analytical chemistry in optics, mass spectroscopy, and chromatography; and development of medical instruments for diagnostics, reanimation and intensive care, as well as various electronic instruments. Taking into account that magnetic resonance is now a technique which is very generally applied in many countries, Laukien extended the production of equipment by founding not only technical offices, but real production plants in other countries, such as France and the USA.

Let me conclude by extending our congratulations to Professor Laukien for winning the ISMAR prize for 1980 and expressing our sincere hope that he, being still a comparatively young man in his mid-fifties, will have many more years of activity in the field of developing new techniques and new equipment to the advantage of science and scientists all over the world.

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