

In Memoriam

To the memory of Stanislas Kielich

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The publications of Stanislas Kielich, when I discovered them in the sixties, allowed me to make a clear link between two domains of knowledge. The first, which had a rather long history, concerned molecular physics, and especially molecular correlations. The second, which burst out following the discovery of the ruby laser in 1960, was related to laser physics. Non linear molecular optics was soaring.

In order to bring memory of these times alive, I would like to briefly tell here what was my first scientific exchange with Stanislas Kielich. . . Stimulated Raman scattering was the topic of the first letter I wrote him in 1965. Our laboratory had a long tradition of research in the field of Raman scattering, which – let us recall- was known experimentally only in its spontaneous form before 1962. My PhD director, René Dupeyrat, belonged to *the Laboratoire de Recherche Physique de la Sorbonne*, this very laboratory where Jean Cabanne had led his renowned pioneering studies which have contributed to the discovery of the Raman scattering, to its understanding and to the birth of its applications. This was the time where the production of the Raman spectrum of a material required an illumination of several hours with a very powerful light source (like a mercury vapor lamp). In 1962, the excitation of nitrobenzol with a ruby laser allowed the fortuitous discovery of stimulated Raman scattering. The spectrum was obtained with a single nanosecond pulse excitation. In fact, it was known, according to the theoretical studies of Placzek in 1937, that a stimulated scattering exists as well as the spontaneous scattering, similar to the existence of a stimulated emission together with a spontaneous emission. But its amplification needs exciting powers far larger than those delivered by classical sources. When we got our first ruby laser in Reims, we began the study of stimulated Raman scattering in various molecular materials.

As it is now well known, a lot of nonlinear effects appear simultaneously in the interaction laser/matter, leading to difficulties in the interpretation of the experimental results. Stimulated Raman Scattering properties revealed at first to be unrelated with the expected properties deduced from the spontaneous spectra. To say it briefly, the exciting beam propagation in the Raman medium was strongly perturbed by the nonlinear refraction index changes, and phenomena such as self focusing played an important role. In order to clarify the understanding of the experiments, we studied the influence of parameters changes- especially temperature- in a lot of molecular materials. . . and we were thus concerned with the role of molecular interactions. A bibliographic research on this subject pointed me to the publications of Stanislas Kielich, and I got in touch with him.

I have kept the letters he wrote me in 1968. . . I read for example: “concerning the molecular correlations, I am sure that their influence in stimulated Raman scattering and in the coherence of the

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radiation is important. . . I hope that the relations between our two laboratories will increase. . .” And Stanislas Kielich enclosed in his letter a reprint of his publication “molecular interactions in optically induced nonlinearities” (IEEE-Journal of Quantum Electronics-QE-4 1968, p. 744). It was a very comprehensive and rich paper, dealing with non linearities of both refraction index and scatterings, taking into account the roles of molecular redistribution and of molecular fields. He listed the values of the Kerr constants of various liquids calculated with different models, which was a very interesting data source for the experimenter.

As concerns the continuation of our exchanges, without giving all the details, I would like to point out some prominent events. . . At first, the presence of Stanislas Kielich as Associate Professor in the University of Bordeaux, in 1971/1972. . . The lectures he gave there were first gathered in a handout “*polycopié*” which was- and is still- used in our laboratory as “the reference” for the calculation of the non linear susceptibility tensors. . . It was said in Bordeaux that “the Professor” was spending long hours of his nights to calculate tensors. . . These tensors, we can find them also in his books published at the University of Poznań in 1972, and in the book “interaction laser/molecule, laser physics and molecular non linear Optics” written with J.R.Lalanne and A.Ducasse and published in France in 1994(Ed Polytechnica).

Another event is the presence of Stanislas Kielich at the 31th meeting of the French *Société de Chimie Physique* organized in Fontevault in 1978(photo). Stanislas Kielich gave there a lecture entitled “second harmonic generation of laser beam in electrically polarized atomic and molecular mixtures”. . . proving- if necessary- the success of the coupling realized by Stanislas Kielich between his exceptional knowledge of the molecules with all the new non linear phenomena induced by the use of powerful lasers.

As an echo to my first exchange with him reported above, which was devoted to Raman Scattering, I have kept the poster realized for the Non linear Optics Conference organized under his responsibility in Poznań in 1978: a beautiful colored poster displaying the famous rings of the anti Stokes Raman

scattering, orange, yellow, green rings, created by the interaction of a red ruby laser with a molecular liquid. . . an image symbolizing all these various changes- color, direction, polarization, coherence-induced by the interaction of laser with molecules. This Poznań Conference, wanted by Stanislas Kielich, completely placed under his scientific and human direction- and presenting some difficulties in an historical period where the opening to foreign researchers could yield to some suspicions- was possible because of the international notoriety he had acquired.

This notoriety has given a great recognition to the Poznań Institute of Physics, created to unify the previous chairs of Physics of the University, and placed under the Direction of Stanislas Kielich since its creation in September 1969. This Institute was very important for him, and I have a letter in which he explains me that he has to delay his stay in Bordeaux in order to assume his new management responsibilities.

When I read once again today all the publications of Stanislas Kielich, I am impressed by the wideness of his competences, the rigor of his calculations, his ability to make immediately the links between his previous knowledge and the new fields opened by the laser optics. It was difficult, in the beginning of the sixties, for laboratories having modest equipments – and I have also this experience- to step in the non linear Optics international scene. . . and we have to pay a tribute to the success of Stanislas Kielich and his group.

Stanislas Kielich loved physics, he loved his country, he had a deep scientific and human honesty and the vainglory was at the opposite of his choices. He remains for me one of a main guide mark I had the fortune to encounter in my researcher profession.