AJP

ISSN : 0971 - 3093

Vol 30, No 2, February, 2021

ASIAN JOURNAL OF PHYSICS

An International Peer Reviewed Research Journal

Advisory Editors : W. Kiefer & FTS Yu

W Kiefer in ELARS during Corona times

ANITA PUBLICATIONS

FF-43, 1st Floor, Mangal Bazar, Laxmi Nagar, Delhi-110 092, India

B O : 2, Pasha Court, Williamsville, New York-14221-1776, USA

Asian Journal of Physics
Vol. 30, No 2 (2021) 219-238
Available on: www.asianjournalofphysics.in

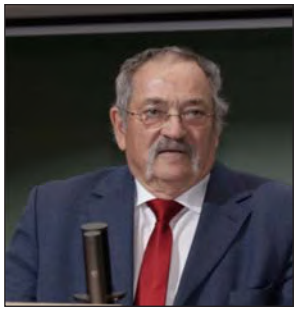
ap

Wolfgang Kiefer – Multi-Talented German Physicist

Rajinder Singh

Research Group: Physics Education and History of Science.
Physics Department, Institute of Physics. University of Oldenburg. 26111 Oldenburg, Germany.

I have written more than 30 books and a number of articles on scientists and politicians. However, I have no experience of writing on a living legend, like Prof Wolfgang Kiefer. Professor Vinod Rastogi, Editor-in-Chief, *Asian Journal of Physics*, told me that he is planning to organize a special issue of AJP honouring him on the occasion of his 80th birthday on Feb 12, 2021, and invited me to contribute something. I happily agreed, as I know Professor Kiefer for a while, though, only through correspondence, and never had the opportunity to meet him personally.



Slide 1. Prof Wolfgang Kiefer

I started collecting information and found a few articles on Prof Wolfgang Kiefer (abb. WK). One of my intentions was to compile a list of his publications, but dropped the idea, after reading his CV (which he sent me); and learnt that the number of his publications is 865 (631 peer reviewed journal articles, 5 books, 50 book chapters, 179 Proceedings/Conference papers). His fields of research vary from Coherent anti-Stokes Raman Spectroscopy to Resonance Raman spectroscopy, and Surface Enhanced Raman Scattering (SERS), development of special techniques for linear and nonlinear Raman spectroscopy. The list of honours and awards poured on him is long. A few of them to be mentioned are: Honorary Doctor (Dr.h.c.) - University of Cluj-Napoca, Romania (2003); Distinguished Service Award of the Society for Applied Spectroscopy (SAS) for serving the Society for more than 20 years; Honorary Fellow of the Society for Applied Spectroscopy, USA (2005); Pittsburgh Spectroscopy Award, USA (2006); first Raman Lifetime Award, XXIV. International Conference on Raman Spectroscopy (ICORS 2014). As far as his contributions to the Raman spectroscopy is concerned, at his 65th birthday, it was high-lighted by "International Conference on Vibrational Spectroscopy" (2006); and Journal of Raman Spectroscopy (2006). He is/was associated with various journals, such as: Applied Spectroscopy (European Editor: 1977-2000), Asian Journal of Physics (from 1992 till date), Journal of Raman Spectroscopy (Associate Editor from 1980 -1999, Editor-in-Chief, 2000-2009), Spectroscopy Letters (from 1996-2006), Trends in Applied Spectroscopy (from 1996-2006),

Corresponding author
e-mail: rajinder.singh@uni-oldenburg.de (Rajinder Singh)

Asian Journal of Spectroscopy (from 1997- 2006), Asian Chemistry Letters (from 1997-till date), Chemical Physics Letters (1998-2003). WK has organized a number of national and international conferences. He is/ was a Member of the following Societies: German Physical Society, Bunsen Society for Physical Chemistry, German Chemical Society, Optical Society of America, Society for Applied Spectroscopy, Coblenz Society, American Physical Society, and American Association for the Advancement of Science.

Now, the question is: what more can be written on a man, to whom the scientific community knows so well? Is it possible to write something new at all ?

As his scientific work is well-known to his colleagues and scientific community, therefore, after discussion with Vinod, I decided to write on his private life, and he (Vinod) happily agreed to include his (WK) most important scientific contributions to the field of Raman Spectroscopy in a separate article in the form of an interview.

First of all, my intention was to understand the roots of his interest in physics and chemistry. What motivated him to study Raman spectroscopy, based on Raman effect which was discovered in Feb 1928. Which path he followed? What is his family background? What is the origin of his Asian connections, in particular, India? In the end, I conclude: What junior and senior scientists can learn from WK's life story.

In order to answer the questions, a historian requires documents. In contrast to Indians, Germans have passion for family history. I am thankful to Prof. Kiefer for providing me documents referred to in this article, as well as for answering my questions. WK is an international scientist as is evident from different honours and awards he got. To keep the article short, I shall explore his Asian, in particular India connections only.

Childhood and early education

Wolfgang Kiefer was born on Feb 12, 1941, in Pforzheim, Germany. Indeed, a critical period in the German political history, that is, the World War II. WK's father Kurt Kiefer was an architect, whereas mother Berta Kiefer was a house-wife. As we shall see later, WK was/is a great instruments builder. It will not be exaggerated to assume that he inherited the talent from his father.

Slide 2. Wolfgang with his older sister Renate, mother Berta Kiefer and father Kurt Kiefer, who died in world war II.

WK went to Primary School Calmbach (1947-1951). After that, until 1954, he was at a "Pro Gymnasium" in Baden-Württemberg. In 1955, mother with children moved to Munich, Bavaria. There he continued in a Gymnasium. In Germany, each state has its own school curricula. In new school, WK had one problem, namely, in his previous school, physics was not taught. Thus, his colleagues were two years

ahead of him. In the very first physics examination, he had worst marking "ungenügend" ("unsufficient"). He did not give up. For the next examination, he prepared well, and achieved the best possible grade. His physics teacher found it difficult to believe. He thought that in written examination, the young man must have cheated. In WK's own words: "*as a consequence I had to solve **all** five physics problems using chalk in front of the black board. I delivered a magnificent spectacle and solved all five problems in very short time to the fullest satisfaction of the teacher.*" Here began his love for physics. In future, at gymnasium he had best possible grading. Not only that, "*From there on, I became the most liked scholar of my physics teacher and I personally wished I could become a physicist*", said WK.

From the foregoing, we see that WK was a young man of strong determinations.

Slide 3. Young Wolfgang Kiefer (1959)

Die Leistungen in den einzelnen Fächern sind wie folgt beurteilt worden:

I. Pflichtfächer:

Religionslehre	gut	Erdkunde	sehr gut
Deutsch	befriedigend	Mathematik	sehr gut
Latein (..... Fremdsprache)	-----	Physik	sehr gut
Griechisch (..... Fremdsprache)	-----	Chemie	gut
Englisch (1. Fremdsprache)	ausreichend	Biologie	sehr gut
Französisch (2. Fremdsprache)	befriedigend	Kunsterziehung	befriedigend
Spanisch (..... Fremdsprache)	-----	Musik	sehr gut
Geschichte	gut	Leibeserziehung	sehr gut

Slide 4. Wolfgang's marking sheet from the year 1960, that is, the year he ended 'Gymnasium' and qualified for the University.

In German evaluation system, Grade 1 ("sehr gut") is the best and 6 ("ungenügend", that is, failed) the last. Slide 4 shows a part of WK's "marking sheet". Evidently, languages were not his cup of tea. In German, English and French he got 3rd, 4th and 3rd grade, respectively. In Mathematics, Physics, Chemistry, Biology and Music his grade was 1, 1, 2, 1 and 1, respectively. In German education system "Social" and "Working" behaviour of a student is too evaluated, and that from primary school to Gymnasium. In Wolfgang's certificate we find the following 'Remark' (translated into English):

"The determined student worked with great diligence and exemplary dedication. His very decent and comradely attitude deserves great recognition. His collaboration in the orchestra and his outstanding gymnastic achievements are particularly noteworthy."

At Gymnasium, WK was not only a good student, but also a very good athlete and a musician. In 1959, he won the youth championship of the Bavarian district "Amper-Würm" of German Gymnastic Association in artistic gymnastics.

Slide 5. Wolfgang demonstrates the "men's vault". With this kind of jump the German Helmut Banz has won a Gold Medal for this discipline during Summer Olympics 1956 in Melbourne.

Slide 6. WK playing clarinet. He taught himself to play the instrument. He was a member of a small school Jazz band.

In June 1960, WK finished gymnasium, and qualified for study at a University.

WK as student and Ph D candidate

German education system is not rigid, as far as the selection of a subject at a university, after the Gymnasium is concerned. For example, WK could have decided for Medicine, Physics, Chemistry or any other subject of his choice. He was extremely good in Geography, Music, Mathematics and Biology. For above stated reasons, he decided for physics.

Slide 7. WK's University Identity Card.

In most of the countries, even today students get M Sc degree without submitting any thesis, and doing research work. In Germany, until 2010 students were given "Diplom-Physik", "Diplom Chemie", etc, that is, a five years degree course. To get "Diploma" students must submit thesis. It is left up to a student, in which field he wants to write his "Diploma thesis".

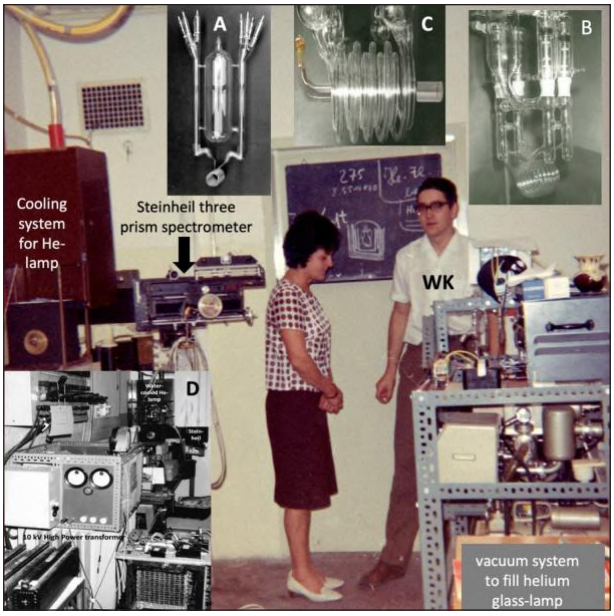
Slide 8. WK (1) with his close colleagues Berndt Feuerbacher (2 BF), Peter Bammes (3.PB), and Rolf Stätter (4.RS).

WK is a renowned scientist in the field of Raman spectroscopy. Therefore, I was curious to know about his choice. I asked him: "What was your motivation to decide for Raman spectroscopy?" He told me that in the end of 1964, he contacted different professors at the Ludwig Maximilians University, Munich, Department of Physics, to find out – what topic they can offer me for "Diploma" thesis. Among them was Professor Josef Brandmüller (a former Ph D student of Prof Walther Gerlach - known for Stern-Gerlach experiment, with which the existence of quantum spin number was proved), who recently had become professor. In WK's own words:

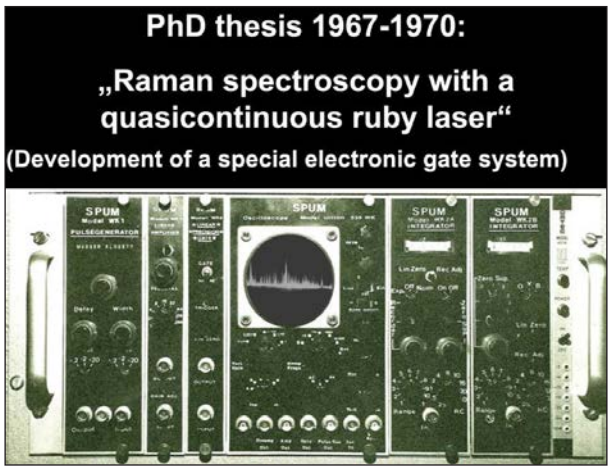
"He kindly lent me a copy of his book entitled "Einführung in die Ramanspektroskopie" (*Introduction to Raman Spectroscopy*) *which he had published together with Heribert Moser in 1962. The book summarized what had been obtained until that time using the mercury arc lamp as excitation source for Raman spectroscopy. I myself had been fascinated learning how this spectroscopic technique is able to give information on the structure of molecules."*

Majority of the Indian students on university level come from high castes. They are incompetent to construct scientific instruments, because in general**,** in its perception in Indian society that craft-work is for lower castes. To work with a hammer, or to blow glass is against their dignity. Thus, only in rare cases young Indian scientists are good instrument makers. This is in contrast to Germany**.** WK is a standard example to show the capability of young Germans to learn at the young age, the importance of making instruments, which are required for research work.

WK wrote his thesis on: "Development and prove of a helium lamp for excitation of Raman spectra". How he came to the topic? And what was his task? He told me that in those days no yellow laser was available. His guide, Prof Brandmüller was interested in the studies of the resonance Raman effect. For that, yellow spectral region as source of light was required. Prof Brandmüller asked him, "*to set up a complete Raman instrumentation with yellow* (*He-587,6 nm*) *excitation. Since the red He-Ne laser source at 632.8 nm was already available at that time and together with the Hg-lines at 435,8 nm (Hg-e, blue*) *and 546,1 nm* (*Hg-c, green*), *the yellow He-line would have fitted nicely the gap between green and red for quantitative Raman line intensity studies in resonance Raman spectroscopy."*



Slide 9. WK with his mother Berta Kiefer showing to her his self-built Raman-set-up with helium lamp excitation. A: the first built helium lamp with a single helix. B: the "Double-helix" helium lamp, which nearly brought double Raman intensity. C: liquid sample tube inside double helix helium lamp. D: the high-voltage (10 kV) power supply for activating and operating the helium lamp.

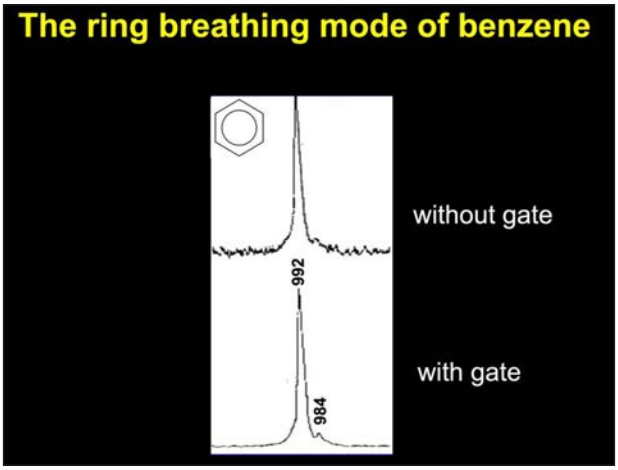


Slide 10. Title page of WK's Ph D thesis. Model WK: model produced by Wolfgang Kiefer. The abbreviation SPUM means: Section of Physics University of Munich.

WK, with great pleasure accepted the challenge and built a He-lamp/Raman set-up. The task was not as easy as it seems. Before the 1960s, Raman spectroscopy did not have many practical applications as today. Thus, to get money for projects at German Universities, in particular, after the WWII, was not an easy task. Sometime, poverty could make a person innovative too! One such example is that of WK. He wrote me that there had been no money available to buy a high voltage/high power transformer to operate the helium lamp. In the courtyard of the physics department, LMU University, he discovered a huge 10 kV high power oil-filled transformer, which was no more in use, because, it was too small to supply electrical

power to the whole University; but big enough to ignite a helium lamp. Young and innovative WK, "*refilled the transformer with fresh oil and built a safety box around the head of the transformer for protection, so he could operate the helium lamp with 10 kV and about 4-5 kW power. Quite some water-cooling was necessary for the lamp*."

WK used a Steinheil three-prism spectrometer. The spectrum was taken, first with photographic plates and later on, with photomultiplier detection. In slide 9, we see young WK proudly showing to his mother Berta Kiefer his self-built Raman-set-up with helium lamp on the left and gas-filling apparatus on the right side.



Slide 11. Demonstration of noise and background suppression by means of his self-developed electronic gate system. Shown is the Raman band of the ring-breathing mode of benzene at 992 cm^{-1} without and with gate. Only with gate system, the isotopical line at 984 cm^{-1} could be separated from noise.

Slide 12. Professor Josef Brandmüller's Group (1965).

Slide 13. WK – an unconventional look.

After 5 years degree course ("Diploma"), a candidate is allowed to do Ph D. Generally, there is no restriction to the subject. For instance, someone who did "Diploma" in Physics is allowed to do Ph D in Chemistry or any other subject. However, in general, candidate remains in the same field; and extends

the work done in "Diploma". So was the case with WK. In his Ph D thesis he "*finally added a deep-red Raman excitation equipment using the ruby laser with 694,3 nm wavelength"* and improved the electronics to enhance the signal-to-noise ratio of the out-put signal. He wrote his thesis on "Raman spectroscopy with a quasi-continuous ruby laser – Raman spectra of inorganic halogen compounds". The title of his thesis, and the instrument constructed by him is shown in Slide 10. All insert plugs of the electronic gate system were made by WK himself; only the frame (power supply) was commercial. Slide 11 shows the improvement of the Raman spectrum due to the newly constructed instrument.

In all photographs, which he sent me, he is well dressed. In one of the photographs (Slide 13) he looks entirely different. First, I thought that it could be due to the hippie movement. I went through the documents, which he had sent me. I found the following: "*WK had been so much busy performing Raman spectroscopy day and night in famous Harold Bernstein's laboratory that he had no time to visit a haircutter. The outcome at end of postdoc time can be seen in picture*."

WK as Post-Doc in Canada

After finishing Ph D, WK went to Canada. There he was Post Doc at National Research Council of Canada (NRCC), Division of Chemistry, Ottawa. He stayed there from 1970 to 1972.

After returning back from Canada, from 1972 to 1977, WK was Assistant, University of Munich and Research Associate, Max-Planck-Institute for Solid State Physics, Stuttgart.

Before you become a Professor - "Habilitation"– German Perfection

In 1927, on the occasion of death centenary of Alexandra Volta, Italian scientists organized a meeting in Como, the birth place of Volta. The conference was attended by renowned physicists like Arnold, Sommerfeld, Max Planck, Ernest Rutherford, and many more. From India, Debendra Mohan Bose, nephew of J C Bose, and M N Saha took part. Saha was highly impressed to see that 27 years old Werner Heisenberg was a Professor at the University of Leipzig. In Anglo-India system this was/is almost impossible. Generally, such promotions are based on seniority, not scientific achievements.

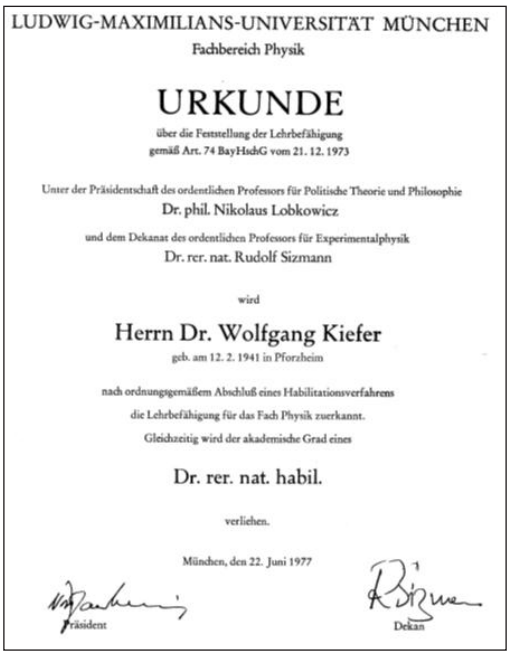
According to Germany academic system, after having Ph D, you are automatically not qualified as a Professor. After doing Ph D, a candidate starts working in research. Again, he had to write a thesis. He had to show his competence not only as an independent researcher, but also as an administrator who is able to guide a research group and get grants from industry and government.

In 1977, WK finished Habilitation in Physics, University of LM-Munich. Now, he was qualified to be a Professor. WK wrote me: "I*n 1977 the situation to become a University professor in physics after habilitation had been very difficult, due to too many "Habilitanden*". *In order to compensate for this, the Bavarian Science ministry decided to provide a second doctor degree, called "Dr. rer.nat.habil." to them*" (that is, habilitation in natural sciences).

In Germany, in order to avoid nepotism, care is taken that a candidate, who works in a particular university, is not allowed to apply for a Professorship, if a post is announced. Not surprisingly, WK applied for the post at the newly founded University of Bayreuth. There he was Professor from 1977 to 1984.

I do not know WK closely. From his CV I got the impression that he is a "restless spirit", and a curious man. For instance, he left Bayreuth in 1985, and went to University of Graz, Austria, there he was Full Professor of Physics, and Head of the Institute for Experimental Physics for three years. The place is known due to Adolf Smekal who had theoretically predicted the effect, which was experimentally discovered by C V Raman and later came to known as the Raman effect. In German speaking area, it is also called Smekal-Raman effect or Raman-Smekal effect. Another eminent physicist from the same university was Ludwig

Boltzmann. The diagram (slide 16), adopted from "Tradition und Herausforderung – 400 Jahre Universität Graz"; K Freisitzer, W Höflechner, H.-L. Holzer and Wolfgang Mantl, Herausgeber, Akademische Druck- und Verlagsanstalt Graz, Austria, 1985 ", shows that due place was given to WK in the history of the university.



LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

Fachbereich Physik

URKUNDE

über die Feststellung der Lehrbefähigung
gemäß Art. 74 BayHschG vom 21. 12. 1973

Unter der Präsidentschaft des ordentlichen Professors für Politische Theorie und Philosophie
Dr. phil. Nikolaus Lobkowicz
und dem Dekanat des ordentlichen Professors für Experimentalphysik
Dr. rer. nat. Rudolf Sizmann

wird

Herrn Dr. Wolfgang Kiefer
geb. am 12. 2. 1941 in Pforzheim

nach ordnungsgemäßem Abschluß eines Habilitationsverfahrens
die Lehrbefähigung für das Fach Physik zuerkannt.
Gleichzeitig wird der akademische Grad eines

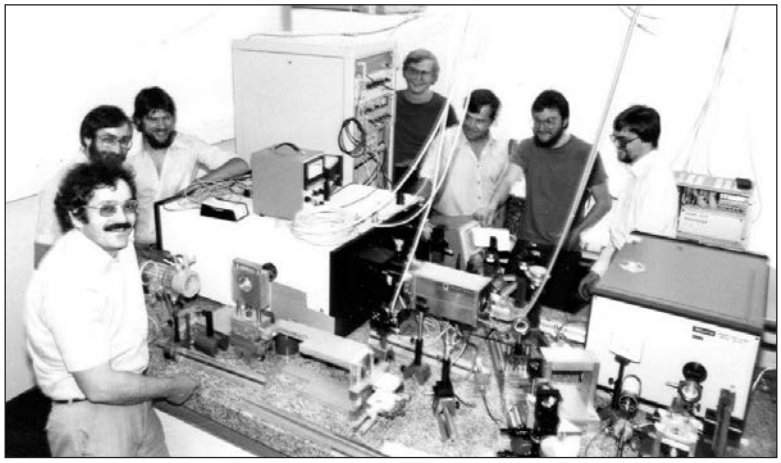
Dr. rer. nat. habil.

verliehen.

München, den 22. Juni 1977

Präsident Dekan

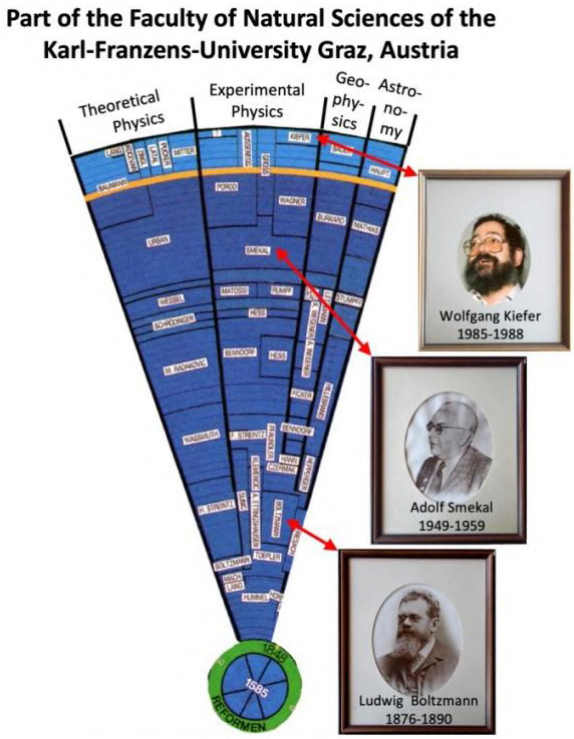
Slide 14. Habilitation thesis: "Contributions to the exploration of the fundamentals of the rigorous resonance Raman effect in molecular system as shown".



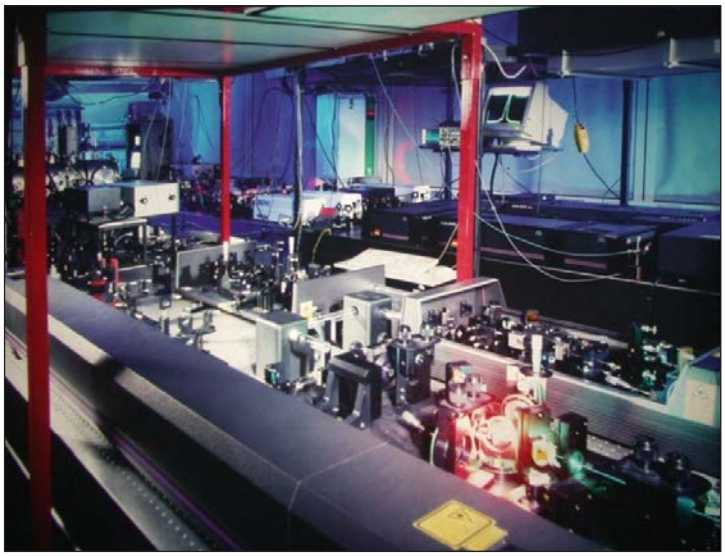
Slide 15. WK with his research group at University of Bayreuth, Germany, in front of a CARS (Coherent Anti-Stokes Raman Scattering) set-up (1980).

It is in the nature of human beings that in the last part of their life, they intend to return to their birth place or a place nearby. WK, who was born in South Germany, came back to this part of Germany. There, from 1988 to 2006, he was Professor of Physical Chemistry and Head of Institute

for Physical Chemistry, University of Würzburg, the university, where, in 1895, the X-rays were discovered by W C Röntgen. For the discovery, he was awarded the first Physics Nobel Prize in 1901.



Slide 16. WK equaled with Adolf Smekal and Ludwig Boltzmann (1985).



Slide 17. The Femtosecond Four-Wave-Mixing Spectroscopy Laboratory. It was WK's one of the six Raman Laboratories at Institute of Physical Chemistry, University of Würzburg.

Slide 18. Celebration of retirement from University. Prof Heinz Schrötter (HWS, supervisor of WK's Ph D), Prof Theodor W Hänsch (TWH) delivering a speech. TWH received Nobel Prize in physics in 2005 for the development of the optical frequency comb technique.

Legacy of WK

There is a phrase that a "man" leaves his prints after his death, if either he had planted a tree, or had a child, or wrote a book. According to my opinion, it is partially correct, because a teacher leaves foot-prints through his students. In particular, in Asian culture. I was almost "shocked", when he told me that he guided 85 Ph D theses. Out of them 12 of his students are now University Professors.

Slide 19. WK's Ph D Students (2006).

WK retired in 2006, but still he is Retired Professor at the University of Würzburg,Germany.

WK and his Asian connections

I wanted to know: when was his first visit to India? WK replied:

I had a contract with the European Commission (*EC*) *to study whether resonance Raman would improve the sensitivity for a Raman LIDAR system to study environmental air pollution. In 1974, I attended a LIDAR conference in Sendai, Japan and the EC paid me a round-a-world flight ticket. It took me five weeks* (*including travel to Japan via USA and Hawaii*) *to come back from Japan travelling around the world and, of course, I stopped in India to see Taj Mahal. Meanwhile I had been in Agra six times showing the Taj to my wife, my sister, and to good friends."*

WK was 30 times in India (status 2020).The research institutions visited by him are:

Banaras Hindu University, Physics Department, (Late Prof Birendra Asthana, 10 times)

Bhabha Atomic Research Centre, Bombay, (Dr J P Mittal and others 3 times)

Indian Association for Cultivation of Science, Kolkatta, (2 times)

Indian Institute of Science, Bangalore, Deptt of Inorg & Physical Chemistry, (Prof S Umapathy & Others; 3 times)

Indian Institute of Technlogy Kanpur, Kanpur, Department of Physics, (Prof H D Bist)

Indian Institute of Technlogy Madras, Chennai, Department of Physics.

Pachaiyappa's College, Chennai, Physics Department, (Dr S Gunasekaran)

St Joseph College, Tiruchirapalli, Physics Department, (Dr A Savarianandan)

Mar Ivanios Collge, Trivandram, Physics Department, (Dr V S Jayakumar, Dr I Hubert Joe, 2 times)

Meerut College, Physics Department, (Prof Vinod Rastogi, 2 times)

NEHU, Shillong (Prof A L Verma)

Panjab University, Chandigarh (Prof V K Jindal)

University of Lucknow, Physics Department, (Prof Poonam Tandon)

Women Christian College, Chengannur, Phys Department, (Dr Sunila Abraham)

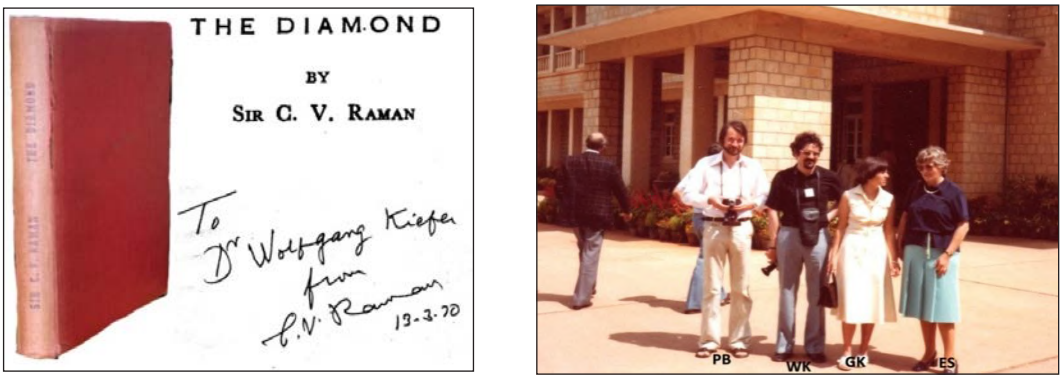
Slide. 20. Left: WK at Physics Department, Banaras Hindu University (BHU). RS: Professor Ranjan Singh, BA: Professor Birendra P. Asthana and SS: Prof. Sebastian Schlücker – WK's previous student (2001). Right: WK Lecturing at International Conference, Banaras Hindu University (BHU), Varanasi, India, Nov. 2008.

It is well-known that C V Raman and his associates discovered the Raman effect at the Indian Association for the Cultivation of Science, Kolkata. WK visited the IACS in 1978 (slide 21).

Slide 21. WK at the Indian Association for the Cultivation of Sciences, Kolkata. Left: WK with C V Raman's student Sukumar Chandra Sirkar (1978). Right: WK lecturing during 60 years Raman Celebration in Calcutta, India WK delivering lecture (1988).

(a) (b)

Slide 22. (a) WK with his wife Gisela at the IISc, Bangalore. Participating in 6th International Conference on Raman Spectroscopy (ICORS) 1978, on the occasion of Golden Jubilee of discovery of Raman effect. (b) WK receiving "Award for Lifetime Contribution to Raman Spectroscopy" on the occasion of "Celebration of 90 Years of Raman Spectroscopy" (Feb 28, 2018). From left to right: Prof H Hamaguchi, Prof S Umapathy and Prof WK. Credit: Prof Tony Parker.



Slide 23. Left: Raman's book "The diamond" with dedication to WK. Right: PB: Dr Peter Baierl (WK's first Ph D student), WK and his wife Gisela Kiefer (GK), and Erika Schrötter (ES) at the Raman Research Institute (1978).

Slide 24. Left: WK with Moran Mor Basilios Cleemis Thottunkal, current Major Archbishop of the Syro-Malankara Catholic Church receiving "First International Raman Award" in Trivandrum. In background - Prof. V S Jayakumar, Physics Department, Mar Ivanios College, Trivandrum, India (2008). Right: After Plenary Lecture at "International Conference on Spectroscopy of Biomolecules and Advanced Materials (ICSBAM)", Christian College Chengannur, Kerala, India with His Grace Most Rev Dr Joseph Mar Thoma Metropolitan (2017).

C V Raman left Kolkata and went to Indian Institute of Sciences, Bangalore in 1933. There, he established the Department of Physics. He continued work on Raman spectroscopy. Thus, the IISc has/had a strong group of scientists working in the field. WK has contact with those scientists and visited the IISc several times in different capacities, last time in 2018 (Slide 22).

C V Raman retired from the IISc in 1948, and founded his own institute, today known as the Raman Research Institute, Bangalore. Before finishing his PhD thesis, WK had correspondence with CVR. In March 1970, CVR sent him a copy of his book "The diamond" with personal dedication. WK visited not only RRI, but also other institutions in South India (Slide 24).

Contact with Chinese Scientific Community

Slide 25. WK receiving Honorary Professor degree (Prof. h.c.) from President of Wuhan University, Professor Tao Delin.

WK has close contact with the Chinese Raman spectroscopy group too. In 2002, he became Member of the Editorial Board of the *Chinese Journal of Light Scattering*. He was Visiting Professor of Hong Kong University of Science and Technology (1993), Guest Professor of Zhengzhou University, Zhengzhou, P.R. China (1995), Honorary Professor (Prof h c.) of Wuhan University, Wuhan, P R China (1995). He was appointed as a member of the International Advisory Group of the Committee of Light Scattering, Chinese Physical Society (2003-2007), and Honorary Professor (Prof h c.) and Academic Committee Member of Capital Normal University Beijing, China (2005).

WK had two Ph D students from China: Dr Chen Tao (now SAP-Vice President) and Dr Er-Jun Liang (now Professor at Zhenzhou University). WK participated in 10 of the Chinese Light Scattering Conferences (from 1991 to 2019). In all these meetings, WK delivered Invited Lectures. The Wuhan University conferred on him an Honorary Professor degree (Slides 25-27)

Slide 26. WK with Prof Kun Huang during 17th ICORS 2000, Beijing. Professor Huang was a famous Chinese solid state physicist. He published a book on "Dynamical Theory of Crystal Lattices" together with Max Born.

Slide 27. WK appointed as Member of IAG of the CLS, Chinese Physical Society.

Japan connections

In 1993, WK was Visiting Professor at the Waseda University, Tokyo. Also, he was Foreign Counselor of the Institute for Molecular Science, Okazaki, Japan (1999-2001).

Slide 28. WK being the Foreign Counselor (1999-2001) of the Institute for Molecular Science (IMS), Okasaki, Japan. Prof. Mitsuo Ito (MI), Director General of IMS 1998; JI: Mrs. Jamiko Ito; TK: Prof. Teizo Kitagawa; KK: Prof. Koji Kaya, Director General IMS (1999).

Slide 29. WK giving speech on the occasion of 70 years celebration of Professor Hiro Takahashi, Waseda University, Tokyo; middle: Prof. H. Takahashi; right: Mrs. Takako Takahashi (2006).

The soft-side of the genius

Old spectroscopists know the importance of photography. At the time of the discovery of the Raman effect in 1928, photograph plates were used to take spectrum. This praxis continued till photographic films were developed. Those who had experience in photography, and in particular spectroscopy, know, how difficult it is to "scratch out" effects from negative. Washing of a negative a few second more than required cause the Raman-lines to disappear. Not surprisingly, WK, who is a good spectroscopist, is also an excellent photographer.

In India, he visited not only laboratories, but also a number of National Parks. He extensively photographed nature. His favorite are Indian tigers. Not surprisingly, his favorite park is "Ranthambhore" in Rajasthan. WK wrote:

"*During the various visits there, I have gained a good friend, the naturalist Chandra Kant, who always accompanied me/us with the safari jeep. Since many years he continuously had sent me pictures whenever a new tiger baby was born in Ranthambhore National Park – so, by now, I do know most of the Ranthambhore tigers.*"

Slide 30. Photographer WK and some photographs taken by him; **A**:Wild Life Photographer WK in South Africa, after ICORS XVI, Capetown; **B**: leopard in Krueger National Park, South Africa; **C**: chinstrap penguins in Antarctica; **D**: polar bears in Arctica; E: polar fox in Arctica; F: tiger in India.

W K visited following National Parks in India

Corbett National Park, Uttarakhand

Bandhavgarh National Park, Madhya Pradesh

Bandipur National Park, Karnatak

Kanha National Park, Madhya Pradesh

Keoladeo National Park, Rajasthan (3 times)

Nagarhole National Park, Karnatak (2 times)

Periyar National Park, Kerala

Ranthambhore National Park, Rajasthan (6 times)

Sariska National Park, Rajasthan

After the retirement

WK retired in 2006, but still he is Retired Professor at the University of Würzburg.

It will be in interest to notice that WK established an Education laboratory. I wanted to know from him: How do you came to the idea?

He replied:

"After I moved from Munich to Bayreuth, Prof Brandmüller lent me a lot of instruments which were not in use anymore at LMU. After his retirement and after Prof Hänsch had taken over, these instruments had been de-registered at LMU and I could use them at Bayreuth-, Graz-, and Würzburg-Universities. After my retirement from Würzburg University, I then used them to set-up my own Raman Lab at home. So, most of the equipment at ELARS is over 50 years old. In addition, I received old instrumentations from colleagues in Austria and USA, who, after their retirements, did also not throw away these instrumentations but gave them to me."

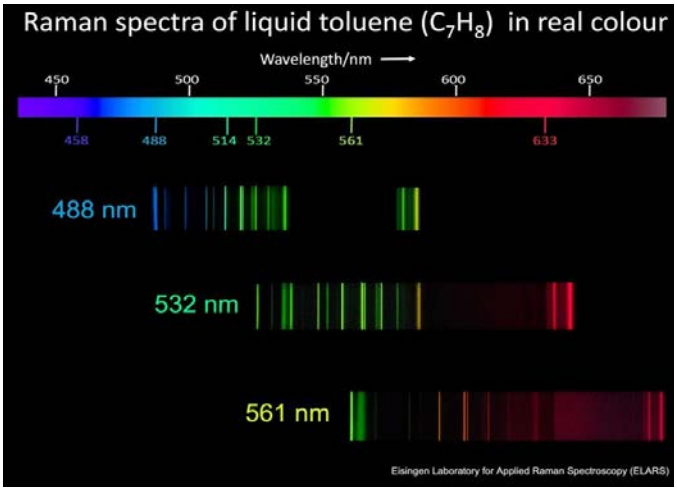
To acquire instrument is difficult enough, but to maintain them, money is required. Thus, my next question was: Who financed his adventure?

He told me:

"I used quite some private money to improve these very old instruments to make high performance Raman set-ups out of them, for example by adding modern CMOS cameras as detectors, notch and special cut-off filters, etc. I also received a lot of support (*OPLSs and many optical parts*) *from my former Ph D student Dr Peter Vogt, who is currently Director Field Sales Europe at Coherent Inc. My mechanical workshop was of great help for me to produce many adjustment parts with only costs for materials. I did everything by my own to establish ELARS, which probably has become the Raman lab with the highest spectral resolution in Germany."*

Further, he told me:

"ELARS was not thought at the beginning to become an "Education Laboratory", more to become a research lab to do Raman experiments I ever wanted to do, but had no time to perform them. However, after having had the idea to make Raman spectra in real colour (Slide 31), *I thought to go towards educational direction. As a result, I gave a lecture at ICORS 2018 entitled "Real Colour Raman Spectroscopy with a DSLR photocamera for Educational purposes".*



Slide 31. Raman spectra of liquid toluene in real color excited with blue, green and yellow laser lines.

Also, I wanted to know from him: How often are visitors?

WK's answer:

"National as well as international visitors are coming several times a year. In last two years all the various research groups of the Institute for Physical and Theoretical Chemistry of Univ. Würzburg, including the mechanical and electronic workshop had visited ELARS."

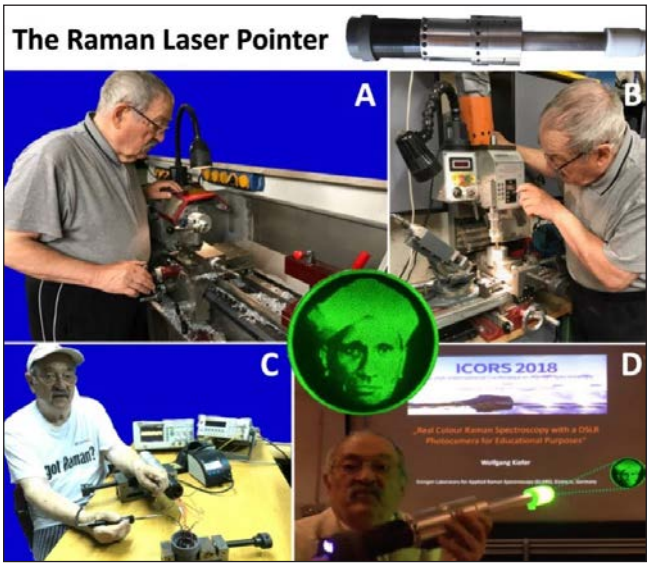
Next, I wanted to know: Would you suggest to other senior colleagues to make such laboratories?

WK says:

"If other senior scientists would have also the possibility to collect old de-registered (*in German: "deinventarisiert"*) *instrumentations over the years of their research, I certainly would recommend to set-up similar laboratories. However, a lot of operational readiness is required and also the willingness to spend quite some private money. My advice to retiring scientists is to make a hobby out of their profession after retirement – they would have a lot of fun, as I do."*

WK in action

Besides setting up his own Raman Laboratory (ELARS),WK has also installed a mechanical as well as an electronic workshop in the basement of his house which allows him to produce himself any mechanical (e.g. adjustment) or electronic part which he needs in his home Raman lab. On the occasion of the celebration of 90 years of discovery of the Raman effect in 2018, he developed what he calls - a "Raman Laser Pointer" (RLP) which replaces the small spot of a regular laser pointer by a small picture of Raman's face in coherent light (Slide 32).



Slide 32. A: WK producing part for RLP on his turning lathe; B: WK working with his milling machine on mechanical part of RLP; C: Finalizing the power supply for the RLP. D: RLP spot in use during lecture given at ICORS 2018; Center: Raman's face in coherent light produced with home-made RLP (*Asian J Phys*, Vol 25, No 2).

For history of science friends

WK told me that:

"he is the only person worldwide who attended all hitherto 26 ICORS meetings starting in Ottawa, Canada, 1969, the last one being ICORS 2018 on Jeju Island, South Korea. He has collected many documents of each ICORS meeting and has summarized the history of ICORS in his opening lecture at the 25th ICORS 2016 in Fortalezza, Brazil. This lecture has been recorded by his wife Gisela and WK has produced a two-volume video which can now be downloaded from internet by clicking:http://icors2020.com/icons-2020/"

And further:

"It says: 'WK paints an amazing fresco of the ICORS history, discussing how linear and nonlinear Raman spectroscopy has developed over half a century as reflected by the previous ICORS conferences.'"

For historians of science, like me, it is a great opportunity to communicate with WK to collect authentic documents and write authentic history of the man Prof. Wolfgang Kiefer and the development of Raman Spectroscopy.

The best in the end

As various photographs show, WK's wife Gisela accompanied him in different conferences. I thought that it would not be fair on my part, if I do not say a few words about her life. I requested WK to write a short write-up. He sent me the following:

"I have met Gisela first in 1957 when both of us participated as teenagers in a dance course in Munich - twelve years later we got married. 1970 and 1975 our two children, son Bernd and daughter Karin, were born, respectively. Meanwhile we are married slightly more than half a century. Due to my professional carrier, we moved with the whole family six times including our stays in Canada (*1970-1972*) *and Austria (1985-1988). I must confess that Gisela is loving me strongly, because she followed me without any lamenting to all the new working places. Since 1978 she also accompanied me in many international conferences all around the globe and made herself many friends - all being peculiar Raman spectroscopists. In order to balance a bit, I myself accompanied her when we both enjoyed many classical concerts conducted by her cousin Maestro Kurt Masur.*

I am particularly thankful to her to clean my working clothes as well as the complete house after I left the mechanical workshop with many small aluminum particles clinging on my shirts and pants and spreading them around in most of the house rooms. In particular, I very much appreciate her patience and consideration that I preferred to spend more time in laboratories and offices to act out Raman spectroscopy rather than to spend enough time with her as usually done by decent husbands - and this over a period of more than half a century. This had been her special contribution to the development of Raman spectroscopy!"

Slide 33. Left: Gisela and Wolfgang Kiefer freshly married. Right: The true love never fades - Gisela and Wolfgang Kiefer on the occasion of 'Golden Marriage'.

Acknowledgements

This article is dedicated to Prof Wolfgang Kiefer and his wife Gisela Kiefer. I am thankful to Prof Kiefer for sending me photographs and detailed information about the photographs. Thanks are also due to Prof Vinod Rastogi for inviting me to write this article and as well for all editorial work by Er Manoj Kumar

[*Received*: 04.11.2020].