V.K. IGNATOVICH

To the 75th birthday jubilee of, a leading scientist of the Frank Laboratory of Neutron Physics.
by A.V. Strelkov

V.K.Ignatovich, a PhD student of the Laboratory of Theoretical Physics, joined our Laboratory in the mid-sixties. It happened largely due to the LNP Deputy Director F.L.Shapiro who immediately appreciated the abilities and knowledge of the young theoretician and offered him a position in LNP. At that time the research focus of the Laboratory was mainly on the investigations in the field of nuclear physics, and F.L.Shapiro got him involved in the discussion of a possible experiment on the search for the existence of an electric dipole moment (EDM) of the neutron. The results of this fundamental experiment could cast light on the situation arisen shortly after the American physicists had observed T-parity violation effects in K-meson decays. For the experiment on the search for the neutron EDM V.K.Ignatovich engaged in calculating the time of neutron confinement in the system of several single crystals by successive Bragg reflections. Having tackled the problem, V.K.Ignatovich unexpectedly suggested that one should search not for a neutron EDM but for an electron EDM in an alternative experiment, which was soon carried out using a high-precision magnetometer in LNP in the group of B.V.Vasilyev.

Later on V.K.Ignatovich got absorbed in ultracold neutrons (UCN), which F.L.Shapiro proposed to use in the neutron EDM experiment. And literally right in front of his eyes these very UCN were first observed in the experiment conducted on the IBR reactor. Afterwards, the young theoretician took an active part in all UCN experiments carried out in LNP and on the reactors of other institutes. He was particularly attracted by an intriguing problem of UCN leakage from closed vessels caused by anomalously high UCN losses after hitting the vessel walls. To explain the reasons for this phenomenon, V.K.Ignatovich put forward a number of hypotheses starting with the assumption of some imperfection of quantum mechanics itself and ending with an idea about surface contamination by hydrogen atoms. Having summed up his knowledge on the subject of UCN, Ignatovich defended his PhD thesis and wrote a monograph “The Physics of Ultracold Neutrons”, which was published in 1986 and later translated and printed abroad. It was the first book on UCN and it still remains a valuable reference material. V.K.Ignatovich found himself increasingly attracted to the wave nature of the neutron. He devoted a number of his studies to the behavior of the neutron as a wave packet and made a series of surprising assumptions regarding the imperfection of the scattering theory. His scientific reputation grew rapidly and he was invited to work in Japan, where he conducted theoretical and experimental investigations in neutron optics.

In 2007 V.K.Ignatovich received D.Sc. degree and the following year his second monograph “Neutron Optics” was published. But it should be mentioned that his passion for neutron optics extends to research in the field of ordinary light optics as well. He has come up with a bold theory to explain the generation mechanism of a mysterious natural phenomenon – ball lightning – considering it as a trap for light photons. V.K.Ignatovich is notable for his constant striving to explore the very essence of physical processes, whether it be experimental instrumental effect or fundamental phenomena in quantum mechanics: Aharonov-Bohm effect, Berry phase or Einstein-Podolsky-Rosen paradox. He speaks at seminars more often than others do, turning them into a lively discussion or even a heated dispute sometimes on the subject being discussed. V.K.Ignatovich has an excellent command of English and more than once he had to work as a simultaneous interpreter at various workshops and conferences.

9. ANNIVERSARIES

V.K.Ignatovich has a strong sense of civil responsibility for the welfare of our society. As far back as the sixties he wrote a letter to the CPSU Central Committee and suggested that N.S.Khrushchev's proposal for free public transport should be realized. During the Arab-Israeli war in October 1973 "hostile" broadcasting stations reported that Islamic extremists from the Black September Organization threatened A.D.Sakharov with death if he did not renounce his letter of protest to the governments of the USSR and the USA, in which he asked to stop arms delivery to the warring parties. It occurred to V.K.Ignatovich that the Soviet leadership might seize the opportunity to get rid of the dissenting Academician. V.K.Ignatovich understood that his warning letter to the government might be late or simply "get lost". Therefore he came to B.M.Pontecorvo and convinced him to undertake some measures to protect A.D.Sakharov. After this conversation Bruno Maksimovich left for Moscow and having returned the next morning, told that the members of the Presidium of the Academy of Sciences had assured him that A.D.Sakharov would be properly protected and safe.

The first failed attempt to ease international tensions between the USSR and the USA during the R.Reagan-M.S.Gorbachev summit in Reykjavík in 1986 did not leave V.K.Ignatovich indifferent either. He addressed an appeal to both Presidents with his own proposals on further improvement of the relations between our countries.

It goes without saying that such social and political activity annoyed the local party leaders who regularly got it in the neck after yet another letter to the CPSU Central Committee from a non-member of the Communist Party V.K.Ignatovich who considered it to be his duty to speak out his opinion and ideas concerning not only physics, but the reformation of our, to his mind, inefficient and bureaucratic state apparatus as well.

V.K.Ignatovich has turned 75. He has three sons, two of whom have graduated from the Moscow State University and work in the USA. Of course, age is beginning to tell on: it takes somewhat longer to get home from work and perhaps he is not so quick to go up the stairs, but it has not dampened his lifelong infatuation with physics in the slightest. He is open to his colleagues and students at all times, always willing to share his knowledge and experience with others. He really enjoys helping to train the next generation of scientists and finds true delight in teaching and inspiring his students. And speakers at seminars always expect his "tricky" questions and principal remarks that are bound to help to get to the core of the problem discussed.

S. MATHIES

To the 75th birthday jubilee of, a leading scientist of the Frank Laboratory of Neutron Physics.
by T.I. Ivankina

It is rather difficult and challenging for me to write about Siegfried Matthies. First, we belong to two different generations, and second, he is more like a teacher to me, therefore pupil's respect and deference to a teacher makes me restrain from too emotional and frivolous statements.

Once I heard a phrase from my physics teacher at the Tula University "He is an excellent physicist and has mathematics at his fingertips". These words fit perfectly to describe Siegfried's professional qualities. There seems to be no problems in physics too intricate for him to solve using sophisticated mathematical tools.

I first heard about Siegfried Matthies in the eighties. Being a graduate student of the O.Y.Schmidt Institute of Physics of the Earth of AS USSR in Moscow at that time, I was concerned with mastering a new research technique – mathematical texture analysis. I was interested in the

possibility of quantitative description of crystallographic textures (preferred orientations of minerals) of quartz-containing rocks with piezoelectric properties. In 1982 a book by Prof. H.J.Bunge, Germany [H.J.Bunge *Texture analysis in materials science* // Butterworths. London. 1982] was published in English. The scientific school of Prof. H.J.Bunge was widely known to the world texture research community. His book was of great interest for both metal science specialists and geophysicists and was often referred to in many scientific papers devoted to the measurement of crystallographic textures of polycrystalline materials by various physical techniques (x-ray diffraction, optical microscope, etc.) and to the quantitative description of textures using the orientation distribution functions (ODF). The Bunge's method was considered to be a basic one for determination of ODF using a set of experimentally measured pole figures (PF). However, while describing the results of the ODF determination procedure, the researchers suddenly began more frequently to speak about large statistical errors or negative ODF values, which could not be by definition. The majority were inclined to attribute the errors to “low-quality measurements” or some flaws in programming. At that time a number of papers appeared by an unknown-to-me author [S.Matthies *On the reproducibility of the orientation distribution function of texture samples from pole figures (Ghost phenomena)* // Phys. Stat. Sol. (b), 1979] who had long been openly writing about the existence of “ghosts”, negative ODF values, and explained them (impossible!!!) by the limitations of the method itself. His conclusions were astonishing. I was faced with the prospect of searching for other ways to quantitatively describe textured polycrystalline materials on the basis of experimental data. But soon S.Matthies himself proposed such a method.

So, the life history of the theoretician S.Matthies began … (All the details of his biography were written by me as told by the scientist himself).

Siegfried R. Matthies was born on the 8th of August, 1937 near Dresden (Germany) in the family of a whitesmith. Having graduated from the elementary school, he completed vocational training courses for young people in the newly-formed GDR and in 1955 was sent to study at the Physics Department of the Leningrad State University.

Life gave him a lucky chance to study under the instruction of prominent professors and to work with outstanding scientists of the time. He attended lectures of V.I.Smirnov on mathematical statistics and of S.E.Frish on physics. He defended his degree thesis at the chair headed by V.A.Fock successfully applying the formalism of electron transfer in atom collisions (on the basis of PhD thesis materials of Yu.N.Demkov) at the nuclear level, i.e. for nucleon transfer. As a result, S.Matthies was sent to the Institute of Nuclear Physics of the Moscow State University (Department of A.S.Davydov) for postgraduate studies and closely cooperated with V.G.Neudachin, Yu.F.Smirnov and V.V.Balashov with whom he maintained a close friendship until the latter’s recent death.

In 1963 S.Matthies defended his PhD thesis on nucleon associations in light nuclei (area that has again become “fashionable” in recent years), having gained a solid background in quantum mechanics and group theory. He attended heated, but very rewarding and insightful Landau’s seminars, and once lost, according to him, "two liters of sweat for half an hour" while struggling with E.M.Livshits to obtain permission for publication of his paper in JETP. 20 years later he met E.M.Livshits again but this time in a more friendly atmosphere on the occasion of the translation into German by S.Matthies and the publication of the well-known short course on quantum mechanics and theory of fields.

Having returned to Germany in 1964, Siegfried became an employee of the Central Institute for Nuclear Research in Rossendorf where for seven years he was fortunate to work together with a world-class physicist and an outstanding person Academician Klaus Fuchs. In cooperation with the

9. ANNIVERSARIES

Scientific Research Institute of Atomic Reactors in Melekess (USSR) in the framework of the program on the development of fast neutron nuclear reactors the behavior and possibilities for reprocessing of paste-like nuclear fuels based on liquid sodium were studied using the approaches of statistical physics and rheology.

In 1971 S.Matthies joined the Laboratory of Neutron Physics, where he worked until 1977. At that time at the suggestion of F.L.Shapiro and under the supervision of K.Hennig a German research group was created to study the energy levels of 4f-electrons in an electric crystal field. An experienced theoretician was required for the interpretation of inelastic neutron scattering experiments. S.Matthies eagerly accepted the challenge though he had to make a “jump” of orders of magnitude in the energy scale and to switch over from atoms (eV) to nuclei (MeV) and to energy-level spacings in crystal fields (meV). He was attracted not only by the possibility of applying his wealth of experience gained in the area of multi-particle quantum systems, but also by new prospects of working on first powerful computers. It should be noted that his love for physics and proficiency in mathematics (at his fingertips) came in handy for this project. The field calculations in ionic crystals were complicated by the poor convergence of the resulting series, which took into account distant ions. S.Matthies had to resort to a trick by using the state-of-the-art tools of spherical functions and group theory, which attracted first noticeable international interest to his studies. Though Yu.M.Ostanevich was rather skeptical about this approach at the beginning.

It should be noted that the “trademark” of Siegfried Matthies is an accurate formulation of physical theories and the fact that all his difficult mathematical calculations yield the result that he can vouch for.

Soon he was invited to work at the Paul Scherrer Institute (PSI) in Switzerland, which was almost unheard of at that time. Having summed up his research work in Dubna, he defended his Sc.D. thesis at the Technical University of Dresden (1978).

Having returned to Rossendorf, S.Matthies planned to apply the approach developed by him for studying metals “abundant with free electrons between ion islands”. However, his life took a new sharp turn related to the development of “texture analysis” (TA), which according to him “has been keeping him captivated in the succeeding decades”.

In the 1960s Professor H.Bunge (who was working in Dresden at that time) made a substantial progress in TA by introducing the ODF and demonstrated its possibilities for the description of technically interesting textured polycrystalline materials. The ODF can be determined by its projections (pole figures) from diffraction data using the Fourier transform method (spherical functions). At that time first neutron measurements of pole figures were carried out in Rossendorf, and H.Bunge moved to FRG. His departure left GDR without specialists who could extend his programs for the rocks with crystal symmetries lower than the cubic one, which were of current interest for geologists.

S.Matthies was turned to for help by geophysicists and geologists. The consequences of the consultations, which at first he considered to be "minor", proved to be completely unexpected. Having an intuitive ability to spot errors he noticed that the measured pole figures exhibit inversion symmetry, and therefore there is no way to determine complete ODF from ‘incomplete’ PFs in the general case. The ODFs found by the Bunge method contained ‘ghosts’ and meaningless negative values, while ODF being a probability function is certainly positive. It was necessary to abandon the Fourier apparatus in the probability world and to find an algorithm completely free of negative numbers. S.Matthies has done a great deal in respect to the analysis and correction of “ghosts” as well as the creation of “true” quantitative texture analysis. In a short time he has become one of the leading theoreticians in the area.

Annual “neutron schools” in Rossendorf in the eighties became a place for meetings between texture researchers from the West and East. And for Siegfried it was time full of scientific trips to the institutes all over the world. Eventually he worked for several years in France, Italy, USA (mainly in Berkeley), gave a year-long course of lectures on the texture analysis in South Korea. In 1989 he was invited to deliver a series of lectures in the Siberian Branch of AS USSR. During this time he has not lost touch with FLNP and its texture research group highly appreciating its creative atmosphere and “calm, mutually considerate style of work” in the Laboratory fostered by I.M.Frank.

I got to know Siegfried and met him personally when I started to work in FLNP (since 1998). It was in 1999 at one of the texture-related conferences held in the University of Göttingen in Germany. Even at that time geophysicists and geologists with full confidence began to apply the quantitative texture analysis to describe the properties of textured rocks using the WIMV method (acronym for its developers Williams, Imhof, Matthies, Vinel). By the way, Galina Vinel is his wife, a co-author of Siegfried's papers and monographs, his hope and support in life.

In 2007, having formally retired, S.Matthies willingly accepted the invitation of the FLNP Directorate to work several months a year as a leading researcher in the group of the late Prof. A.N.Nikitin. In cooperation with the FLNP specialists he was going to study and describe the properties of anisotropic geological materials with pores, cracks, non-spherical grains and ODFs of these forms. Besides he was eager to share his vast wealth of knowledge and experience with young scientists. In recent years of his work in FLNP S.Matthies has successfully developed and applied the so-called GeoMixSelf (GMS) method that allows one to describe in a reasonable approximation the properties of rocks.

He also takes interest in the problems related to neutron diffraction experiments, for example, he has some ideas on the optimization and improvement of quality of information from diffraction spectra obtained with the SKAT and Epsilon diffractometers.

Siegfried Matthies is the author of about 130 publications and monographs. His algorithms, especially the WIMV-method to determine ODF, the method of standard functions and the method of geometrical averaging of elastic properties are important elements of the popLA (Los Alamos, USA), BEARTEX (Berkeley, USA) and MAUD (Trento, Italy) texture analysis software packages and are widely used all over the world. In 1983 S.Matthies received the Gustav Hertz Award of the German Physical Society and in 1984 he was conferred with the title of Professor of AS GDR.

Siegfried is a very versatile person. As a physicist-theoretician he sticks to a “monk” style and prefers solitude, peace and quiet (he wrote his degree thesis in a wardrobe of the student dormitory). His one more life credo is that "one should be able to do everything whenever possible, but it is better not to show it up". The result was that he headed groups of theoreticians, worked for several years as an advisor in the administration of AS GDR and an assistant secretary of JINR Vice-Director K.Lanius, was a trade-union activist and so on.

Siegfried Matthies enjoys working together with experimenters. Easily overcoming difficulties in his own everyday life, he advises: "If you have problems of a practical nature, ask theoreticians". In his early days he went in for athletics (with the results "slightly better than the woman’s world records"), military pentathlon, and sports tourism. He was one of three founders of Tito Pontekorvo's stable in Dubna, sailed his motorboat "Progress" all over the nearby vicinity, travelled a lot and visited various corners of Russia and around the world.

S.Matthies eagerly shares his knowledge and experience with his colleagues, especially with talented young physicists. However, he does not like to be excessively published and to attend

numerous conferences. He believes that "in contrast to pop singers, scientists sing their song only once".

"I owe much of the good in life to my wife G.V.Vinel, - S.Matthies likes to say, - whom I met in the first year of the University and cooperated closely thereafter". In 2012, they celebrated their golden wedding anniversary. He has a large family: two children (also physicists) and five grandsons who make him happy with their success in studies, sports and music.

That is what Siegfried Matthies is: a versatile scientist, a superb teacher and a man who excels in almost everything he puts his mind to.

A.V. STRELKOV

To the 75th birthday jubilee of, a leading scientist of the Frank Laboratory of Neutron Physics.
by E.P. Shabalin

Alexander V. Strelkov came to the Laboratory of Neutron Physics (JINR) in 1960 after graduation from Gorky University, – a young man with tousled hair in a frayed sweater. He already knew a lot, but did not have much experience and skills yet. But now… Now each time when I enter Sasha's office (his lifestyle, his unique manner of interacting with people leave no choice but to call him this way), a book about Robert Wood, "a wizard of a physical laboratory", comes to my mind. The same overwhelming thirst and incredible liking for physical experiments… The same ingenuity and complete mastery in performing them… This is not Harry Potter's sorcery; this is true magic of a talented physicist.

When you write or tell about an extraordinary person, it is difficult to decide where to begin. The name of Sasha Strelkov immediately brings to your mind a wide variety of events, phenomena, episodes, activities. But probably in a scientific journal first of all it should be noted that Alexander Vladimirovich is a brilliant physicist-experimenter, the best expert in neutron detection. With the help of his wonderful detectors he can do anything you like: at a distance of kilometers find out whether this or that JINR accelerator is in operation, sober up enthusiastic supporters of sensational discoveries of cold fusion, measure gravitational levels of ultracold neutrons and many other things.

But also in another aspect of life – in his ability to live an honest, eventful, interesting life – Sasha is as talented and unique as he is in physics. He is a true original and an oddity in a good sense of the word. Insulating tapes on his bicycle wheels instead of tires, three cups of tea for lunch, "dacha" in a godforsaken wood tens of kilometers away from the nearest village where he levels awfully heavy logs 30 cm in diameter with an accuracy of one micron (!) using only a lever, flights on a glider, parachute jumps, falls from a ski jump, ingenious and funny caricatures and stage sceneries – all these are perfectly natural and characteristic of him.

For colleagues who happen to drop into his office he always has in store a few enthusiastic words about this or that remarkable person and a physicist with whom he has recently talked (it must be added that Sasha is very lucky to encounter and become friends with wonderful people), some physical riddles and brain-teasers (his most favorite problems are about half-full bottles in the ocean, though he is a teetotaler himself), or interesting stories and recollections of some past events that others have forgotten long ago, and which probably were not so impressive and heroic as he depicts them in his story, but as the Russian saying goes «what is a song without a bayan*?» And Sasha Strelkov like legendary Pushkin's Boyan* from "Ruslan and Ludmila" is a keeper and narrator of folk tales, myths, and legends of our Laboratory.

And all these are not an “epatage” or a show meant to draw attention to himself. These are the joy of life, these are his emotions and love, his interest to people… To give life to four children, to teach physics to a blind young man – if this is not love, tell me what it is?

Sasha’s selfless devotion to the memory of his Teacher F.L.Shapiro forty years after his death is amazing. In winter on every anniversary of Shapiro’s death whether it be a snow storm or biting frost, freshly-cut spruce boughs from the tops of Dubna fir-trees (bottom branches are completely cleared away by our gardeners) appear on Shapiro’s tomb in Moscow.

The only drawback of Alexander Vladimirovich is that he has fostered several first-rate physicists but cannot find time for his own Doctor’s degree thesis.

And I forgot to mention three magic letters - UCN. They are a part and parcel of A.V.Strelkov’s work all his life. If you hear the words «ultracold neutrons», it means that Alexander Vladimirovich and his «Dunya» (not a girl-friend, but a UCN counter) is sure to be somewhere around. Since 1968 when he together with Yu.N.Pokotilovski and V.I.Lushchikov under the supervision of F.L.Shapiro was the first in the world to prove the existence of these marvelous particles (registered as a discovery), he has always been faithful to them and still continues to surprise the world with unique possibilities of their application for solving the riddles of the Universe in Grenoble (unfortunately, our reactor cannot produce enough UCN). However, the word “to surprise” is not quite correct. Sasha mostly follows the motto “What one should do is not to surprise the world, but to live in it”. And he lives his life to the fullest, generously and honestly…

Wishing you lifelong health and many happy returns of the day, Alexander Vladimirovich… Sasha!

**Russian button accordion “bayan” was named after the 11th-century bard Boyan.*

9. ANNIVERSARIES