

## He is lucky to have seen the trace of massive Majorana neutrino

Professor Hans Volker Klapdor-Kleingrothaus is 70. He was born on January 25 1942 at Reinbek, Germany. He finished “Johanneum gymnasium” and graduated from University in Hamburg. In 1969 he got his PhD in experimental nuclear physics at the University of Hamburg. Klapdor's first experimental works (1967-1983) were about gamma spectroscopy and heavy ion reactions at the accelerators of Hamburg University and the Max-Planck-Institut fuer Kernphysik in Heidelberg, where he started as a staff member in September 1969. Hans Klapdor received his Habilitation in 1971. For 40 years he has been giving lectures and seminars at the Universities of Hamburg and Heidelberg. He became Professor in 1980. He is a supervisor of almost 100 Ph.D. and diploma students. He is an author of several topical textbooks in neutrino physics and related problems (<http://www.klapdor-k.de/Publication&Books/Books.htm>), which have been translated into many languages. The last one is “SEVENTY YEARS OF DOUBLE BETA DECAY. From Nuclear Physics to Beyond-Standard-Model Particle Physics“, published in 2010.



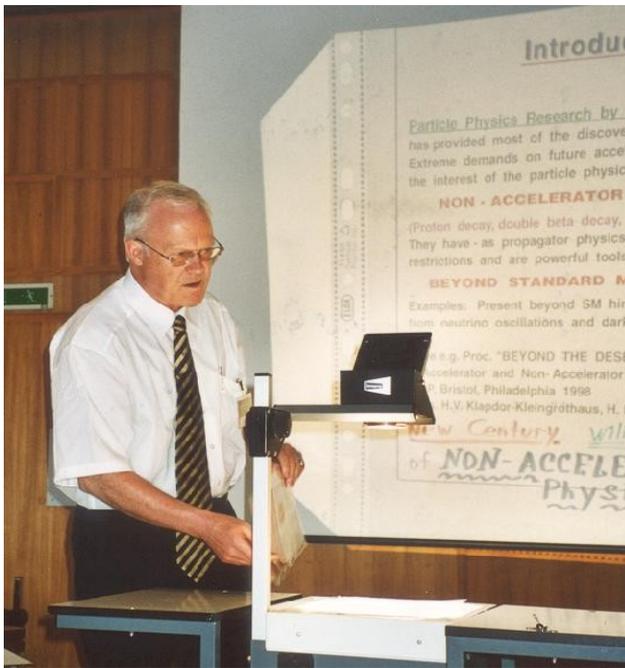
In 1976 Klapdor turned to investigations of beta decay of isotopes far from the stability line and applications of these results to astrophysics, in particular, it concerned synthesis of chemical elements and estimation of the age of Universe. On this basis he, as one of the first at that time, has managed to estimate the famous Cosmological constant which is nowadays known under the name of Dark Energy. Since 1983 Klapdor's scientific interests have shifted for decades to experimental and theoretical research on weak interaction in nuclei and its consequences for astrophysics, cosmology and particle physics, especially in the context of the elusive neutrino masses and properties. His evaluations of nuclear matrix elements for the double beta decay for decades have been a milestone in the field.

Being consistent in his views, in 1987 Klapdor proposed and organized, together with scientists from the Moscow Kurchatov Institute the famous “Heidelberg-Moscow” Experiment for search for neutrinoless double beta decay (CERN Cour. 31 Nr 10 (1991) p. 14). The experiment with enriched Germanium 76 ran in the Gran Sasso Underground Laboratory from August 1990 till the end of

November 2003 (CERN Cour. 42 Nr 2 (2000) p. 8). Up to now this experiment is still the most sensitive one, worldwide in the field.

Furthermore, in 2001 after very sophisticated analysis of the data Prof. Klapdor-Kleingrothaus demonstrated the first signal of neutrinoless double beta decay in Ge and therefore claimed that neutrino is a Majorana particle and the total Lepton number is not conserved. Since 2004, evidence of the observed signal has been on the level of 6 sigma and the obtained effective neutrino mass is given to be  $0.22 \pm 0.02$  eV. It is the right place to stress here that this value of the neutrino mass has been obtained under the assumption about the absence of any other sources of the neutrinoless double beta decay, such as, for example right handed weak currents, leptoquarks, or SUSY.

What is most important and most intriguing here is that he managed to obtain the result which he has declared and expected in advance at the stage of planning of the experiment. Namely, in 2004-2006 this experiment reached the sensitivity to the neutrino mass at the level of 0.2 eV, as it was planned in 1987. The evidence of the neutrinoless double beta decay was "the extra gift of Fate".



The very accurate and radio-pure Germanium detectors used in the Heidelberg-Moscow experiment fitted very well the direct dark matter search experiments which have started to mature since 1993. Owing to perfect detectors, H.V.Klapdor naturally entered the field by means of the experimental and theoretical study of the Dark Matter problem. Furthermore, in 1997 he proposed a very new approach in the form of a next generation big-size and large-mass Experiment GENIUS (CERN Cour. 37 Nr 9 (1997) p. 16) which was simultaneously aimed for search of signal for neutrinoless double beta decay, Dark Matter and solar neutrinos at a very low energy (CERN Cour. 37 Nr 10 (1997) p.19). The idea was very new and to test it in 2003 the experiment GENIUS-TF (small prototype of the GENIUS project) with six naked Ge detectors in liquid nitrogen started to work in the Gran Sasso Underground Laboratory, Italy (CERN Cour. 43 Nr 6 (2003) p. 9).

Another small-scale Klapdor's experiment HDMS (Heidelberg Dark Matter Search) which used two Germanium isotopes to reduce background operated in 2000-2005 also in the Gran Sasso. For a long time, due to the unique architecture, the HDMS was the first in sensitivity in the world for WIMP-neutron spin coupling.

Obviously the contribution of Prof. Klapdor-Kleingrothaus in both fields of neutrinoless nuclear double beta decay and direct dark matter search will be brilliant for a long time. His ability to arrange the experiments in such a way when experimental and theoretical research interplay very effectively deserves special mentioning. The patents on reactor technology (1985) and pulse shape analysis for Ge detectors (1999), as well as physics awards of the German Physics Society (1982), of the Center of Excellence of Japanese Ministry of Technology (1997) and of JINR, Dubna (1998, 2006) are only small and incomplete illustrations of his achievements.



Klapdor's high level of professionalism and strong interpersonal skills, together with fluent speaking several foreign languages, such as French, Russian, Italian, to say nothing of English, have constituted strong background for his wide and successful international cooperation with the USA (Brookhaven, Los Alamos, Maryland, Boston, CEBAF, Irvine, Missouri), Italy, England, the USSR and Russia, Japan, Finland, the Netherlands, France, Korea, China.

This cooperation covered common research not only in experimental and theoretical physics, but, for example, production of enriched and non-enriched Ge detectors by the ORTEC company (Oak Ridge, USA) as well. The most fruitful and most decisive for Klapdor's life was cooperation with Russia, which was started in 1970 with his first half-year scientific visit to the Institute of Nuclear Physics, the University of Leningrad. Furthermore, this long-term cooperation with the Kurchatov Institute, Moscow (1988-2001) included common projects "Investigation of the Double Beta decay of Germanium-76" or famous "Heidelberg-Moscow experiment" and "Search of Dark Matter with Ge-Detectors", as well as cooperation with JINR (Dubna) and NIRFI (Nishnij Novgorod) under projects "Supersymmetry in High-Energy-Physics, in rare decays and in the Dark Matter" (1996-1998) and "Experimental Dark Matter Search and its Theoretical Support" (2001-2009).

This wide-world cooperation and Klapdor's personality guaranteed his reputation as the main organizer of several series of conferences and symposia on very hot topics of modern particle and

nuclear physics. For many years (since 1984) he has been permanent Member of the International Advisory Committees of numerous conferences. Since 1990 he has been a Member of NuPECC (Nuclear Physics European Collaboration Committee) EPS.

In July 1986, following his growing interest in weak interaction and neutrino physics, H.V.Klapdor proposed and organized an International Symposium on "Weak and Electromagnetic Interactions" in Heidelberg, on the occasion of the 600th anniversary of the University of Heidelberg. The next Symposia were held in Montreal, Canada 1989; Dubna, Russia 1992; Osaka, Japan 1995; Santa Fe, the USA 1998. Later in October 1987 he took an active part in organization of an International Workshop on "Neutrino-Physics" in Heidelberg. Further in 1995 he organized an International Workshop "Double Beta Decay and Related Topics" and in 1998 – the first International Symposium on Lepton and Baryon Number Violation, in the European Center of Theoretical Physics (ECT) in Trento, Italy. The experience he gained there allowed him to start successfully two important series of international scientific meetings. The first one is the International Conference "Dark Matter in Astro- and Particle Physics", started in Heidelberg in 1996. The next conferences were held in Heidelberg 1998 (CERN Cour. 39 Nr 3 <http://cerncourier.com/cws/article/cern/28008>), 2000, and in Cape Town, South Africa 2002; Texas, USA 2004; Sydney, Australia 2007; Christchurch, New Zealand 2009 (CERN Cour. 49 Nr 3 <http://cerncourier.com/cws/article/cern/38705>). The second one is the International Conference on Physics Beyond the Standard Model, which started in 1997 in Tegernsee (Germany). The next conferences were held in Tegernsee, Germany in 1999, and in Oulu, Finland, 2002 (CERN Cour. 43 N2 (2003) p. 29, <http://cerncourier.com/cws/article/cern/28815>), Tegernsee in 2003 (CERN Cour. 44 Nr 5 (2004) p. 35, <http://cerncourier.com/cws/article/cern/29099>), Cape Town, South Africa 2010 (CERN Cour. 50 Nr 8, <http://cerncourier.com/cws/article/cern/43811>). Both series are of high modern interest and importance.



This wide spectrum of his achievements in very different fields of physics has made him a very famous and a very prestigious scientist with huge experience and intuition in the nuclear structure of the double beta decay, in neutrino physics and astrophysics, as well as in many other related and completely not related topics.



Among the latest, it is worth mentioning here that he is a yachtsman, he is a real hunter - his trophies are such exotic animals as kudu, oriks, impala antelope. He is an active mountain-climber, he has conquered the Mont Blanc (4810 m, in 1964), the Matterhorn (4477 m, in 1966), the Zugspitze (2962 m, 4 times, the latest in 1994), the Großglockner (3798 m, 5 times, the latest in 2001), the Monte Rosa Dufourspitze (4634 m, in 1980), the Ortler (3905 m, in 1982), and the Gran Sasso (Corno Grande - 2912 m, in 1995). He is planning to climb the Matterhorn again in 2012.

With big pleasure and gratitude I look back at the 15 years of my very fruitful collaboration with Prof. Hans Volker Klapdor-Kleingrothaus. I would like to stress that he is a real servant of the Science; the scientific truth is the main and unchangeable goal of any his research. He is the first and the sternest judge for himself. He is very scrupulous about his scientific image. He will never say a word if he hesitates that the word is not correct.

On behalf of all his friends, I wish him good health, new achievements and the Nobel Prize!

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