

Preface

Nuclear physics is an exciting, broadly faceted field. It spans a wide range of topics, reaching from nuclear structure physics to high-energy physics, astrophysics, and medical physics (heavy ion tumor therapy). The *Symposium on Exciting Physics* held from 13 to 20 November 2011 at Makutsi Safari Farm, South Africa has aimed to bring together specialists from many of these fields for a constructive dialogue. New developments were presented and the status of research was reviewed.

A major focus was put on nuclear structure physics, dealing with superheavy elements and with various forms of exotic nuclei: strange nuclei, very neutron rich nuclei, nuclei of antimatter. Also quantum electrodynamics of strong fields was addressed, which is linked to the occurrence of giant nuclear systems in, e.g., U+U collisions. At high energies nuclear physics joins with elementary particle physics. Various speakers addressed the theory of elementary matter at high densities and temperature, in particular the quark gluon plasma which is predicted by quantum chromodynamics (QCD) to occur in high-energy heavy ion collisions. In the field of nuclear astrophysics, the properties of neutron stars and quark stars were discussed. A topic which transcends nuclear physics and which is close to my heart was discussed in two talks: The proposed pseudocomplex extension of Einstein's General Relativity leads to the prediction that there are no black holes and that big bang cosmology has to be revised. Finally, the interdisciplinary nature of the conference was further accentuated by talks on protein folding and on magneto-reception in birds and many other animals.

Much of the research discussed at the symposium is also conducted at the Frankfurt Institute for Advanced Studies (FIAS) which is dedicated to interdisciplinary theoretical research in the natural sciences. The establishment of FIAS goes back to the initiative of the former president of Frankfurt University, Prof. Rudolf Steinberg, who invited me and the neuroscientist Prof. Wolf Singer (Max Planck Institute for Brain Research) in 2004 to lay the foundation for a new independent broad-based research institute. To make this possible we had to search for support from funding institutions and also from private sponsors. Very important in this respect was my contact with Prof. Carlo Giersch and his wife

Senator h.c. Karin Giersch who sponsored the FIAS-building (see the picture below), to my mind one of the nicest scientific institutes worldwide. More than 150 scientists (physicists, biologists, chemists, ...) are presently working at FIAS as fellows, guest scientists, doctoral students, etc.; quite a number of them are attending and contributing to this conference.

I suggested to my South-African colleague and friend Prof. Zebulon Vilakazi to hold this conference at Makutsi, which I have known from former visits. Makutsi gives us the feeling of “real Africa”, not like the big towns like Johannesburg and Cape Town which represent “Europe in Africa”.

The Makutsi Safari Farm was founded in the late 1970s by the German Dr. Gerhard Weber. A mathematician by training, Dr. Weber came to South Africa on a professional assignment, fell in love with the country and decided to settle there, founding the Makutsi Farm at a wonderful location, combining a beautiful landscape and fascinating wildlife. Dr. Weber organized our lecturing hall in the neighboring camp and the daily trips back and forth through the bushveld: fantastic! Our sincere thanks go to him, his family and his staff for having arranged all this so excellently.

My special thanks go also to my Capetown colleagues Dr. Richard Newman and Prof. Zebulon Vilakazi for their cordial help, and in particular to Mrs. Laura Quist, my secretary, and to Mrs. Daniela Radulescu, our ‘chief financial officer’ at the Frankfurt Institute für Theoretische Physik. Dr. Joachim Reinhardt in his attentive and reliable way has coordinated and prepared the presentations for the printing. They all helped to make this symposium a success!

The proceedings of the Makutsi symposium are published as the first volume of the “FIAS Interdisciplinary Science Series”. This new series of books published

Prof. Senator E. h. Carlo Giersch



Senatorin E.h. Karin Giersch



The Frankfurt Institute for Advanced Studies

by Springer-Verlag will comprise monographs, multi-author volumes and conference proceedings dedicated to all areas of research pursued at FIAS. I am grateful to Springer-Verlag for making this possible and in particular to Dr. Thorsten Schneider for constructive cooperation and continuous support.

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Walter Greiner

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