unique format, project groups comprising professors who begin or conclude their studies of a joint subject in the course of any given academic year will be funded over the next few years. Furthermore, there will continue to be a packed programme of academic workshops hosted by fellows or early-stage academics who gain funding through FRIAS's call for applications for junior researchers wishing to hold conferences. These conferences are complemented by presentations arranged by the faculties for which FRIAS offers use of its premises and support in organising the event. From October 2015, FRIAS will also fund up to five Junior Fellows from the University of Freiburg for one year.

These activities are continuing to bring large numbers of researchers to FRIAS from all corners of the globe, allowing the Institute to keep fulfilling its role of increasing our university's prominence worldwide. Even though FRIAS no longer ranks as one of the world's largest institutes for advanced study, its global network has grown recently as a result of it playing a very active role in the international associations established for institutes of this kind, such as UBIAS or NetIAS (Network of European Institutes for Advanced Study).

Joint fellowship programmes, like those already established with the University of Strasbourg Institute for Advanced Study (USIAS) and more recently with the Institute for Advanced Research (IAR) of Nagoya University, are also being sought by other institutes striving to work more closely with the University of Freiburg. Although yet to be determined, the Institute's financial framework following the expiry of our core funding in 2017 may open additional windows of opportunity. Finally, it should also be noted that instead of falling into ruin following the funding decisions made by the Excellence Initiative Grants Committee on 15th June 2012, FRIAS with its new format has remained a locally, nationally and internationally acclaimed institute which continues to enrich the academic world and to attract attention to the University of Freiburg.

Hermann Grabert
(Academic Director
Natural Sciences

Prof. Dr Hermann Grabert is stepping down from his role as Academic Director at FRIAS at the end of this academic year. He has belonged to the FRIAS Board of Directors since the Institute was founded in 2007.

AT THE INTERFACE BETWEEN FUNDAMENTAL AND APPLIED RESEARCH – A FRIAS RESEARCH FOCUS IN THE CONTEXT OF THE ENERGY TRANSITION

How is scientific work carried out within the FRIAS research focus "Designed Quantum Transport in Complex Materials"? And how do fundamental and applied research come together in the German research community? In this interview, FRIAS Fellows Prof. Andreas Buchleitner, Chair of Quantum Optics and Statistics at the University of Freiburg; Prof. Tobias Schätz, Professor of Experimental Atomic, Molecular and Optical Physics; Prof. Stefan Weber, Professor of Physical Chemistry at the University of Freiburg; and Prof. Eicke Weber, Director of the Fraunhofer Institute for Solar Energy Systems ISE in Freiburg, answer these questions and more.

from left to right: Tobias Schätz, Stefan Weber, Andreas Buchleitner, Eicke Weber

FRIAS: We are delighted that you have taken the time to participate in this joint discussion. First of all, we would like you to tell us about the main objectives of your research focus.

Andreas Buchleitner: We are using the "Designed Quantum Transport in Complex Materials" re-search focus to gain a microscopic understanding of the basic physical processes which determine or possibly limit the efficiency of energy-related technologies. More specifically, the subject deals with the conversion of light into energy or vice versa, as is seen in photovoltaics or light-emitting diodes, for example. To help us achieve our objectives, both fundamental researchers and applied researchers are working closely together. Fundamental research has seen such developments in quantum transport theory and experimental diagnostics that the quality of data has led theoreticians to challenge certain assumptions and reflect on completely new topics. All the while there was "dirty data", there were also "dirty" theories; today, however, we have much cleaner data and must therefore develop correspondingly cleaner theories.

FRIAS: One important focus of your project is the collaboration between fundamental and applied researchers. Thinking about your experiences to date, what must each side contribute in order for this cooperation to prove fruitful?

Tobias Schätz: The comment on dirty and clean experiments and theories is, to put it in provocative terms, a good example of the type of contribution made by theoreticians. It is a complicated matter with people tending to regard "dirt" as something they do not understand or something which cannot be applied. However, the question is whether the system can be significantly improved by cleaning up the "dirt" or finding better ways to describe it when nature does not necessarily feel a compulsion to clean up everything and anything. Therefore, the main question we are asking ourselves and which is spurring us on is that of how much we should actually be cleaning things up. The natural world is, of course, completely different to the conditions we can create in the lab. This means that we have to reinte-

from left to right: K. Seibel, B. Kortmann, E. Weber, A. Buchleitner, T. Schätz, E. Weber

grate "dirty" elements into experiments in a controlled manner. This is what will make the collaboration incredibly exciting.

FRIAS: How are external guest academics making a contribution to the day-to-day research you are conducting at FRIAS? With members coming and going, is it possible for the central idea of the project to be consistently conveyed to the group?

Tobias Schätz: External Fellows and guest academics are very keen to join us to present their work to our interdisciplinary project group, for example. It is fascinating to see how people, some of whom are true leaders in their respective fields, encounter, and I mean this in the positive sense, stumbling blocks when coming into contact with neighbouring academic disciplines and when striving to make themselves understood.

Stefan Weber: It is very important that we meet every Tuesday and try to understand what the others are doing, even if their work is sometimes very far removed from our own field of research. For example, we invited Prof. Spiros Skourtis to join us as a fellow. As a theoretician studying electron transfer, he is interested in our investigation of complex systems and offered to hold lectures for us in the Institute of Physical Chemistry. These have proved very popular and stimulate lively discussions between himself as a theoretician and ourselves from the experimental angle. Overall, exchanging ideas with international colleagues has acted as a catalyst for medium- to long-term projects. We have forged contacts, identified new problems and found opportunities for collaboration and I am in no doubt that we will see further developments in the next few years even beyond the funding provided by FRIAS.

Andreas Buchleitner: One benefit of our working group at FRIAS is that it allows us to unite numer-ous renowned colleagues in Freiburg who would otherwise rarely be in the same place at the same time. This has also had a positive impact on the university, for example through the opening of our research centre to masters students. The students are required to write a term paper and will be exposed to the fellows' scientific discourse within the department. We currently have ten students who are each given an introduction to the topic and literature as well as help to prepare their presentation by one of our fellows. This ensures that the discussions are beneficial for everyone involved. We see these students as important junior researchers in the medium to long term.

FRIAS: Prof. Weber, would you say that fundamental research at German universities sufficiently tackles the difficulties, tasks and challenges associated with the social project that is the energy transition?

Eicke Weber: I believe that in Germany there is definitely still a requirement to reinforce the im-portance of applied fundamental research which takes into account the implications for technology and society. I feel that our small project is an excellent example of how it is possible to carry out outstanding quantum research on a topic which has true scope to be applied in practice.
To answer your question, applied fundamental research is taking place in Germany but not yet to a large enough extent. The energy transition is an especially urgent case, where subjects such as battery technology were neglected for decades.

FRIAS: This, of course, raises the question of agenda setting. Who do you think should be responsible for deciding which topics should be researched? Policymakers, for example?

Eicke Weber: I always exercise caution when discussing this matter. One of the best institutions that we have established here in Europe in the last twenty years is the European Research Council (ERC), which bases its decision to approve research grant proposals purely on scientific quality and innovative strength. I very much wish that in parallel to the ERC, which focuses on fundamental research, a second institution, such as a European Technology Council or Innovation Council, could be set up for applied research.
I believe that it makes sense for the topics chosen by policymakers to be used as guidelines, to also ensure that sufficient funding can be made available. However, in my opinion it is most important to look for creativity, ideas and leading minds; the topics will then emerge for themselves.

FRIAS: So you believe that the prerequisites are generally in place in Germany for the gap to be bridged between research which heavily involves the practical application of science and universal fundamental research?

Tobias Schätz: I definitely get the impression that you can go a long way in Germany with good ideas. When it comes to science, we certainly do not make stabs in the dark. The concept of blue skies research may sound good but a project should have a rough set of objectives from the start. Often a simple feeling is sufficient, the sense that there is something there which you want to investigate, even if you cannot precisely define it. To me, the intention to better understand nature already represents an absolute desire to apply the research to the real world. We in Germany should remember where our greatest strengths probably lie, i.e. producing great minds rather than brown coal. This calls for researchers to act self-confidently and to stick to their ideas even if the industrial sector is not always interested in them at first.

FRIAS: To conclude, we would like to return to the energy transition. In general, what role are research and technology playing in the energy transition in Germany?

Andreas Buchleitner: There are simply a vast number of completely unresolved scientific questions, such as those concerning the microscopic understanding of light-energy conversion. The energy transition will confront us with significant challenges over the next twenty years. Our core area of research lies right at the heart of this issue and it is something that the next generation of researchers is enthusiastic about.

Eicke Weber: I think it will become clear in our lifetime that climate change is the dominate force we will be facing. I hope that one day we reach the point where we drop everything else and become aware of the urgency of this project.

FRIAS: The energy transition is truly an interdisciplinary project par excellence, which opens up other issues that are also of interest to social scientists, such as the question of when collectives become capable of acting and how to bring about changes in social behaviour.

Andreas Buchleitner: This makes it an ideal model for the new Sustainability Center Freiburg, where we are participating in a pilot project on one of the key issues being studied within our FRIAS research focus.

Eicke Weber: An example of how the necessary fervour can be created is the first Moon landing, when people's imaginations were so inspired that they were willing to invest tremendous sums in the Apollo programme.

Eicke Weber: The energy transition really is a high-risk project in which Germany is acting as a think tank for the rest of the world.

Andreas Buchleitner: China is already looking closely at what we are doing and it would be fantastic if the Chinese could begin following in our footsteps.

FRIAS: Thank you very much for participating in this lively and informative discussion.

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