Establishing a Center of Excellence in Mathematics and Theoretical Physics in Palestine: the First Steps

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We present a brief account of the history of the project from its conception to its current status. In particular, we trace the major steps that led to the establishment of the UNESCO Chair and the convening of the "Palestinian Conference on Modern Trends in Mathematics and Physics" (28–30 July 2008) at Birzeit University. The mission and goals of the Center as well as an implementation strategy are explained in full detail.

1. The Beginning

The "European Committee for Establishing a Center of Excellence in Mathematics and Theoretical Physics at Birzeit University, Palestine" (ECCE Birzeit) was launched on 11 October 2003 by Bernd Aulbach[1] and the present authors. The first author, Ulrich Eckern, is a solid state theoretical physicist who, two years earlier, had founded the initiative for establishing peace and conflict studies as a new interdisciplinary theme at Augsburg University. The second author, Elaydi, is a mathematician who worked closely with Bernd Aulbach for many years in the area of difference equations and discrete dynamical systems. Through several meetings, the three of us developed the idea of the Center of Excellence in Mathematics and Theoretical Physics. The choice of these two subjects was mainly determined by our own expertise. Moreover, two of us, Aulbach and Eckern, had cooperated successfully for several years within a Research Training Group (funded by the German Research Foundation, DFG). This experience demonstrated to us the advantages of a project in which mathematicians and theoretical physicists work closely together. The addition of the word "European" was chosen to reflect our expectation, and hope, that the European Union would become a major partner and funding source since it was apparent

[1] On 14 January 2005, Professor Bernd Aulbach suddenly and unexpectedly passed away at the age of 57 years. He would have enjoyed seeing the remarkable progress of our project.

from the start that major financial resources will be required to start and operate the envisaged Center.

We chose to aim high, having in mind internationally outstanding institutions such as the International Center for Theoretical Physics in Trieste, or the Kavli Institute for Theoretical Physics in Santa Barbara. By virtue of Saber Elaydi's contacts in Palestine, and his special relationship with Birzeit University, we approached the administration of Birzeit University with our proposal. We also contacted several colleagues around the world. The response was overwhelming and positive, which encouraged us to formulate the details of our project and post our ideas on a website[2] designated to the Center.

A major step forward happened almost accidentally: a special issue of *europhysicsnews*, the newsletter of the European Physical Society (issue no. 1, 2004) was devoted to "physics for development", so we contacted several of the contributors, among them Annick Suzor-Weiner, vice-president of Université Paris-Sud 11 at Orsay. She replied almost instantaneously to our e-mail, showing immediate interest in the project. She also established contacts with the PEACE Program – the Palestinian European Academic Cooperation in Education affiliated to UNESCO – as well as with the PEACE advisor Dumitru Chitoran, whose support has been invaluable ever since. As a result of this Ulrich Eckern was able to present ECCE Birzeit at the PEACE conference in Bethlehem (February 2005) and, most importantly, meet several representatives from Palestinian universities, including Birzeit University's president Nabeel Kassis.

In the next section, we present a summary of the project and discuss in the final section some aspects which, from our point of view, will be decisive in the successful and lasting operation of the Center.

2. Project Description[3]

Idea

A Center of Excellence in Mathematics and Theoretical Physics at Birzeit University (BZU) in Palestine will be established in response to the need for university capacity which will contribute to the reconstruction and development of the Palestinian society. The Center will serve as a focal point for research, program development, training and knowledge sharing. It will facilitate cross-border cooperation through linkages with universities and research centers in different parts of the world and hence will open avenues for state-of-the-art technology to enter Palestine. A high, internationally competitive scientific level will attract leading scientists from all over the world. There will also be opportunities for Palestinian academics to undertake short-term study or attachments abroad and to cooperate in setting up well equipped laboratories. In addition the Center will

[2] http://www.physik.uni-augsburg.de/ifk/ecce/

[3] Based on the presentation by U. Eckern and N. Kassis to the PEACE Steering Committee Meeting, UNESCO, Paris, 30 November 2006; with minor revisions. This and related documents are publicly available at ECCE website, see previous footnote.

enhance the quality of teaching at the Palestinian universities, and develop teaching materials and methodologies for secondary education.

The Center will focus on mathematics and theoretical physics, two disciplines which have fertilized each other for several centuries. In the present context, it should be emphasized that a thorough education in these disciplines is mandatory for every modern, technologically oriented society, especially in a region which cannot rely on natural resources – and that such an education will have a long-lasting positive effect, since students will be trained in areas most useful for today's and future job markets. Finally, mathematics and physics are fields based on 'hard' facts, only to be judged by logic and experiment, and not by political opinion: hence in these disciplines difficulties of communication across frontiers will be alleviated.

Mission and Impact

The main mission of the project is to establish a first rate Center that will be competitive enough to attract and retain highly qualified international mathematicians and physicists, particularly from Europe. The Center will perform multiple tasks including:

- promoting research in mathematics and physics in Palestine;
- training students up to the PhD level in mathematics and physics;
- retaining high quality Palestinian scientists by providing them with funding and research opportunities;
- forging and solidifying international cooperation in mathematics and physics between Palestine on the one hand and the European Union and the United States on the other hand;
- helping to develop and promote educational programs and pertinent pedagogical issues in mathematics and physics.

This would result in a drastic transformation of Palestinian academic standards in mathematics and theoretical physics to be in parity with those in the developed countries. Since Palestine has limited natural resources, the only way to thrive economically is to create a technologically advanced society. Establishing the Center is a step in the right direction.

The impact of the Center on the Palestinian academia will be tremendous. The Center will not only help in alleviating the brain drain problem in Palestine, but will indeed attract highly qualified Palestinians in the Diaspora. The Center will have a first rate library, an active program of visiting scientists, and will hold seminars, workshops, and international conferences on its premises.

First Steps

The basic idea was developed late in 2003 in discussions between two mathematicians (Aulbach, Elaydi) and a theoretical physicist (Eckern) at Augsburg University. In the following months, contacts to potential supporting scientists were established, with remarkable success, as well as to the administration of Birzeit University and to PEACE. A webpage was established. The project was publicly announced and discussed in detail during the PEACE Bethlehem conference (25–

27 February 2005). The administration of Birzeit University developed a detailed budget plan a few months later. On various occasions, support from UNESCO's Division of Higher Education was sought and confirmed by its director, Georges Haddad, who suggested preparing an application within the UNITWIN/UNESCO Chairs Program. In addition, the project is supported by UNESCO's International Basic Sciences Program and its director, Maciej Nalecz.

UNITWIN / UNESCO Chair & Network

The core partners of the project: Birzeit University, Augsburg University, Trinity University, University Paris-Sud 11, and PEACE submitted the application to establish an UNESCO Chair & Network in April 2006. The official agreement for the establishment of the Chair at the Faculty of Sciences, Birzeit University, was signed on 1 December 2006. The main functions of the Chair include:

- building local contacts with mathematicians and physicists in Palestine, as well as with the administrations of the Palestinian universities;
- conducting, on a regular basis, workshops and symposia in mathematics and physics, as well as on pedagogical issues pertaining to mathematics and physics education;
- approaching local politicians and the Palestinian ministries concerned;
- establishing contacts with local and international organizations and businesses, to obtain the necessary funding for the Center and to assure its launching in due time and its sustainability as a benchmark institution in the region.

Financial Aspects

Enormous efforts will be necessary in order to establish an institution with the highest scientific reputation and international visibility. There will be about 20 faculty members, divided equally between mathematicians and theoretical physicists, at the full, associate, and assistant professor level. Furthermore, 20 postdoctoral assistants and 35 supporting staff are needed. The professors and postdoctoral researchers will be able to supervise about 10 to 20 MSc and 5 to 10 PhD students. On this basis, estimates have been made for the costs involved. The land area will be donated by Birzeit University: an area of approximately 35,000 m^2 will be needed, corresponding to 2.8 million euros at current value. Capital investments (buildings, library, computers, etc.) would be approximately 7.5 million euros, and annual maintenance and running costs (salaries, library, equipment, international travel, visiting scientists, etc.) would amount to about 4.2 million euros.

Obviously, these amounts cannot be shouldered entirely by UNESCO, or by individual universities or science funding agencies. We therefore hope that the European Union will become a major partner in the project.

Supporters and Partners

In addition to about 25 individual scientists, the following institutions pursuing closely related goals have confirmed their support of the project:

- Abdus Salam International Center for Theoretical Physics (ICTP), Trieste, Italy
- Center for Advanced Mathematical Sciences, American University of Beirut, Lebanon
- Center for Applied Mathematics and Theoretical Physics (CAMTP), Maribor, Slovenia
- European Physical Society (EPS)
- International Society of Difference Equations
- International Union of Pure and Applied Physics (IUPAP), C13: Physics for Development

Implementation

The Center will be established in cooperation with the administration of Birzeit University and other member universities of the Palestine Council of Higher Education. The Center, however, will retain a clear independent status but will abide by the local laws governing institutions of higher education in Palestine.

In order to ensure effective procedures as well as clear responsibilities, it is suggested to establish a relatively small Steering Committee, with 6 members from the group of proposing scientists, 3 representatives from Palestinian Universities, and 3 representatives from institutions/organizations (e.g. EU, UNESCO). The Steering Committee is responsible for ensuring the highest, internationally competitive scientific standard of the Center. It is also responsible for the overall direction and strategic planning of the Center.

Establishment of UNESCO Chair

On 1 December 2006, the agreement to establish the UNESCO Chair in Mathematics and Theoretical Physics at Birzeit University was signed in Paris. Henry Jaqaman, formerly professor in the Physics Department at Bethlehem University, was appointed Chair holder as of 1 September 2007.

3. Remarks

Establishing a Center of Excellence in Mathematics and Theoretical Physics, located at Birzeit University but for the benefit of all Palestinian universities and the region at large is, without doubt, a very ambitious project. There are numerous hurdles, financial, scientific, and political which have to be overcome. We wish to emphasize in the sequel some aspects which we believe are crucial for a lasting success of the project.

Supporting Mathematics and Physics Education at all Levels

The aim of the Center will be twofold. On the one hand, students will be trained in both mathematics and theoretical physics, up to PhD level. The curriculum of study will complete and broaden the existing Bachelor programs, and include basic and applied topics. In particular, the Center will promote those fields of study in mathematics and theoretical physics that are relevant for the development of the Palestinian society and the region at large. On the other hand,

the Center will promote and emphasize research in both fields. This will be accomplished by sponsoring grants, holding workshops and conferences, inviting international scholars for extended periods, and building up a first-rate library as well as computer facilities. The focus of the Center is, at first, on Palestinian students, but in the long run it also will be open to other students from the Middle East.

An additional function of the Center is to enhance the quality of teaching and research in mathematics and physics at all Palestinian universities, and to develop teaching materials and methodologies in mathematics and physics for secondary education.

Science for Technological Development in Palestine and the Region at Large

The Center will concentrate on mathematics and theoretical physics. We wish to emphasize that, even though mathematics and physics are basic sciences, a thorough education in these disciplines is mandatory for every modern, technologically oriented society, especially in a region which cannot rely on natural resources. Solid training in mathematics and physics will have a long-lasting effect, since students acquire expertise in areas which are decisive for today's as well as future job markets, for example, in information technology, nanotechnology, and materials science.

Interdisciplinary Aspects

On the one hand, theoretical physics relies to a large extent on the "language" and techniques provided by mathematicians; on the other hand, mathematical developments have been initiated several times by ideas developed in physics. In recent years, this transfer of ideas in both directions has again become significant, and is very fruitful. Hence within the Center of Excellence cooperation and exchange should be a major objective. The topics to be chosen must be of course up-to-date, and the projects at the forefront of today's research, like, for example: non-linear dynamics, complex systems, materials science, quantum chaos, quantum information, mathematical biology, as well as some aspects of life sciences and biophysics.

Science at an Internationally Competitive Level

It is most important that the research projects at the Center are of highest quality and internationally competitive, to ensure international visibility and acceptance by the scientific community at large. This will also be ensured by visiting scientists who will contribute to the scientific profile of the Center. There shall be a lively exchange of professors as well as lecturers and postdoctoral assistants in mathematics and physics with the local Palestinian universities.

As described in some detail in the previous section, a Steering Committee shall be established which will be responsible for quality assurance as well as for the overall scientific direction and strategic planning of the Center. In addition, an 'Advisory Board' or 'Evaluation Committee' will shortly be established, which will consist of four to six internationally recognized and experienced scientists, for example, from the group of supporters. This Board/Committee will act

independently from the Steering Committee and will be responsible for the annual evaluation of the progress of the project.

In conclusion, even though the proposed Center of Excellence is a large-scale project with several foreseeable and unforeseeable difficulties to overcome, the tremendous support we have received during the past few years is heartening. Many well known scientists, mathematicians and physicists, from around the world have embraced, wholeheartedly, the proposed Center of Excellence. Likewise, Palestinian scientists, living in Palestine or in the Diaspora, have shown great excitement and enthusiasm to the proposed Center. It is our hope that the Center will be the principal forum for a productive scientific collaboration among the people in the region and a catalyst for a change to a lasting peaceful development in Palestine.