Center for Advanced Mathematical Sciences (CAMS)

The First Regional Center for Mathematical Sciences in the Arab Middle East:

The Center for Advanced Mathematical Sciences (CAMS)

at the American University of Beirut (AUB)

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CAMS, AUB

Introduction

The Center for Advanced Mathematical Sciences (CAMS) at the American University of Beirut (AUB) promotes research in disciplines that make significant use of mathematical techniques, such as Mathematics, Physics, Chemistry and Natural Sciences, Engineering, Computer Science, Economics and Business. Situated in the oldest and largest American-Chartered University in the Middle East, CAMS offers to visitors and researchers a magnificent view on the Mediterranean, and refreshing walks in the beautiful campus of AUB. The Center is located in Beirut, a cosmopolitan city with five thousand years of history and culture, where one can enjoy many tourist attractions.

CAMS was founded in 1999 through the efforts of an international group of scientists with the primary goal of becoming the premier center of excellence for research in the mathematical sciences in the Middle East. The purpose of the Center, according to its official mission statement, is to promote research and graduate studies in mathematics and to serve as a focal point for collaboration among mathematicians and scientists in Lebanon and throughout the region. CAMS has a unique role to play as a leading regional institute for mathematical research. Its aims are to create opportunities for top-quality research and teaching, to encourage academic collaboration and interdisciplinary research at AUB and in the region, to serve as a flagship institute within AUB academic plan to revitalize scholarship, and to attract exceptional faculty to the university.

In February 2002, CAMS was named an associate of the Millennium Science Initiative (MSI) for the Middle East. The goal of MSI is to create and nurture world-class science and scientific talent in the developing world.

<u>CAMS Activities</u>

CAMS has a core faculty who hold joint appointments at the Center and in their respective departments at AUB. The faculty includes a director who manages the Center in consultation with the university Provost and an International Advisory Committee of distinguished scholars. In addition to its core faculty, the Center has 86 Associate Scholars (as of January 2003), who conduct research in related fields such as physics, mathematics, chemistry, civil engineering, electrical and communications engineering, biomedical engineering, and business and management. CAMS Associates use the research and computing facilities of the Center, participate in its scientific programs, and shape research directions to be undertaken at CAMS. In the course of their research work, they interact with AUB faculty and students, and typically give seminars and workshops. CAMS also offers good library facilities with access to many electronic journals and data basis, and a good Visiting Scholars program. From 1999 to 2002, the Center received around 50 Visiting Scholars from North America, Europe, and the Middle East, who conducted research and offered seminars, lectures, and short courses. CAMS hosts a regular series of seminars, conferences and lectures, and invites speakers in various disciplines, from a number of universities, to talk about their field of specialty. More than 100 seminars were organized from 1999 to 2002, covering a wide kaleidoscope of current scientific topics.

CAMS is equipped with the state-of-the-art technology to best accommodate associate and guest researchers. High-speed Internet connectivity, excellent access to electronic sources of scientific literature and a fully integrated seminar room are available, as well as high performance clusters for scientists looking to perform demanding computations. Recently, CAMS has installed a 16 processor IBM P630 Cluster, procured by utilizing a grant from the American Schools and Hospitals Abroad (ASHA). This High Performance Computing platform, named IbnSina, will consolidate the role of CAMS in becoming a regional center for scientific computing. The Cluster comes as a significant addition to the already existing commodity-built clusters: a 4 node Intel PIII Beowulf cluster and a 4 node Digital Alpha cluster. With an annual budget of $200,000, the range of activities of CAMS remains modest. However, the high quality of the research and training activity at the Center, as well as the installation of a computer system that is the most powerful in the region, bodes well for the future.

Challenges faced by CAMS

CAMS suffers from the bad reputation of the 15 years of civil war (which ended in 1991), which earned Lebanon an image of violence. Many scientists who have been invited to visit the Center have been reluctant to come as a result. Although the country is now very stable and many tourists are flowing in, the negative picture persists. Moreover, the Middle East is a region of conflict. Events that occur in neighboring countries give the impression that they affect Lebanon, thus dissuading many scientists from visiting the Center. To become a genuinely regional center, CAMS must aim to triple the funding available to it. More fund raising is needed especially from Arab countries. CAMS also needs stronger support from Europe. The Center is also affected by the relative lack of overlap of research interests between different researchers in Lebanon. This has hindered collaborative efforts between scientists, as the country does not have a critical mass of researchers in any one field of specialization.

The problems mentioned above can be solved through the following steps: establish more links with USA and European funding agencies to support visits, conferences, workshops and summer schools; add more contacts of scientists interested in helping science in developing countries; encourage more visits to CAMS (all who visited were pleasantly surprised); start an effective Ph.D. program to attract good students from Lebanon and the region; encourage regional collaborations by supporting extended visits from scientists in the region and experts from the West; and unite the efforts of libraries by having combined subscriptions to electronic journals.

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Conclusion

CAMS has now established itself as a premier center of excellence for research in the mathematical sciences in the Middle East. CAMS needs however a vigorous effort in fund raising to increase its size while maintaining its qualities.

For more information, check out the website of the Center: http://www.cams.aub.edu.lb

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APPENDIX A: CAMS Faculty

Ali Chamseddine, Director, Ph.D. 1976, Imperial College, London. Research area: supersymmetry, string theory and noncommutative geometry.

***Kamal Khuri-Makdisi*, Ph.D. 1993, Princeton University. Research area: Number theory and Automorphic forms.**

***Wafic Sabra*, Ph.D. 1991, University of London. Research area: String theory, quantum gravity.**

***Jihad Touma*, Ph.D. 1993, Massachusetts Institute of Technology. Research area: Non-linear dynamics and Chaos.**

APPENDIX B: International Advisory Committee

The CAMS International Advisory Committee (IAC) is an international group of highly distinguished mathematicians and physicists, who evaluate the academic activities of CAMS annually, and recommend the appointment of its faculty and director. The IAC members are highly experienced scientific leaders who have been involved in the administration of some of the world’s top institutions in mathematics and physics. They are:

1. **Sir Michael Atiyah, IAC Chairman:** one of the world’s leading mathematicians (Fields Medal, 1966); former President, Royal Society, UK; Honorary Fellow, Mathematics Department, University of Edinburgh.

2. **Dr. Luis Alvarez-Gaume**, Senior Scientist, European Organization for Nuclear Research (CERN), Geneva.

3. **Dr. Jean Pierre Bourguignon**, Director, Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France.

4. **Dr. Jürg Fröhlich**, Professor, Institute for Theoretical Physics, Swiss Federal Institute of Technology (ETH), Zurich.

5. **Dr. Roman W. Jackiw**, Jerrold Zacharias Professor of Physics, Massachusetts Institute of Technology.

6. **Dr. Nicola N. Khuri**, Professor and Head, Laboratory of Theoretical Physics, Rockefeller University, New York.

7. **Sir James Mirrlees**, 1996 Nobel Prize Winner in Economics; Fellow in Economics, Trinity College, Cambridge University.

8. **Dr. Edoardo Vesentini**, President, Accademia Nazionale dei Lincei, Rome, Italy; Professor of Mathematics, Politecnico di Torino.

APPENDIX C: Major Conferences

1. Symposium on Computational Science, May 13-15, 1998.

2. Flow, Friction, and Fracture, July 1-7, 1998.

3. The Mathematical Sciences after the Year 2000: A Prospective View, January 11-15, 1999.

4. First Beit-Mery Workshop on Mathematical Sciences: Geometry and Physics, January 11-15, 2000.

5. Workshop on String Theory and Noncommutative Geometry, May 31-June 5, 2000.

6. Workshop on Finite Element Methods, December 16-20, 2000.

7. Summer School and Workshop: Dirac Operators, Yesterday and Today, August 27-September 7, 2001.

8. Summer School on Parallel, Distributed, Mobile and Internet Computing, July 8-19, 2002.

9. First Workshop on Dynamics and its Applications, October 21-25, 2002.

10. International Conference on the Discrete Simulation of Fluid Dynamics, planned for August 2003.

11. Many more are planned.

APPENDIX D: Institutional grants to CAMS

1. **Lounsbery Foundation, New York. Major grant, 1999-2001.**
2. **Schlumberger Corporation. Major grant, 2002-2003.**
3. **ASHA (American Schools and Hospitals Abroad).**
4. **International Center for Theoretical Physics (ICTP), Trieste, Italy.**
5. **Geraldine Dodge Foundation, New Jersey.**
6. **UNESCO, Cairo office**
7. **Clay Mathematics Institute, Cambridge, Massachusetts.**
8. **Banque Audi, Beirut, Lebanon.**

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Footnote: 1 :Presented at the special session Physics in Developing Countries at TH-2002, Paris, July 2002. To appear in Proceedings.