ENSF
THE EMERGING NATIONS SCIENCE FOUNDATION

Newsletter

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Dear Readers,

We concluded 2009 with great satisfaction and looked forward to 2010 with an enlargement of our funding program. We not only plan to continue those programs started in 2008 to help develop science as well as increment science appreciation by the public, but we are now planning to host international conferences. Moreover, we are continuing the *ENSF Prize for Best Poster in Plasma Physics* for young scientist in developing nations to encourage them to conduct original research of international importance in this field. ENSF's policy to participate in international events shall also continue to enhance its understanding as to where we should focus our efforts. Our centre of attention shall remain focused on young and highly motivated researchers from developing nations in Asia and Africa who in the end shall make a difference for their homeland.

This year, we started to solicit news items and opinion of young researchers on issues in science policy and scientific research being conducted in their regions as well as the state of educational institutions. We got a good response to our request. We have included a report in this issue on the status of higher education in South Asia in the field of engineering sciences and technology as well as a news item.

Professor K. Tahir Shah

International Collaboration

- **Meeting with General Tariq Majeed, Chairman Joint Chiefs of Staff Committee, Pakistan**

ENSF chairman had a tele-meeting with General Tariq Majeed, Chairman, Joint Chiefs of Staff Committee, Pakistan, during his visit to Italy in March 2010. They discussed various issues related to R&D in Pakistan and the alternative sources of energy which may contribute to the solution of Pakistan's energy problem. The proposal, National Initiative on Frontiers of Science of Technology, which was presented to the Prime Minister of Pakistan last year, was the main theme of discussion. General Majeed emphasized cooperation between ENSF and many Pakistani research institutions such as the National Center for Physics in Islamabad and the National University of Science and Technology, also in Islamabad.

Focus on Higher Education in South Asia

Jameel-Un Nabi

Acquisition of knowledge equips one with specific understanding and skills, and also conditions attitudes that influence interpersonal relationships. Knowledge of the richness, diversity and interdependence of the physical, biological and behavioral elements of the world in which we live adds the broader context that induces tolerance and constructive behavior. Higher education is a process of development of the mind for learning, derived from critical examination of information that is available globally; experience; (observation of) role models; and other means; to prepare one for versatility of application, and growth of new knowledge and skills.

In South Asia, higher education generally refers to education above grade 12 and roughly corresponds to the age bracket of 17 to 23 years. The higher education system is made up of two broad sectors: the university/degree awarding institutes and the affiliated college sectors. There is a strong correlation between what happens at primary and secondary level education and the state of higher education. For instance, 83% of children in India are enrolled in primary schools compared with 94% in Iran and 98% in South Korea. In Pakistan it is a mere 56%. These figures later translate to the condition of higher education sector in these countries.

Thus looking at the top 500 universities in the world, one can see a few universities from China, Japan, Singapore and India and a few more from nations such as Malaysia, Indonesia, Turkey Iran and Pakistan. Amongst the countries in South, India today has the largest reservoir of PhD scinetists and teachers, numbering in tens of thousands. Institutions such as Tata Institute of Fundamental Research, Madras Institute for Mathematical Sciences and the five Indian Institute of Technology are well-reputed world-wide. The table below gives these ratings.

Country	Top 10	Top 50	Top 100
China	1	2	2
Hong Kong	0	2	3
India	0	0	2
Japan	1	2	3
Other Asia	1	1	3
Sub-total	3	7	13
Australia	1	6	7
Canada	0	3	3
UK	4	8	16
USA	11	2	33

However there exists a huge gap between the few tier one schools and the large number of tier two and three schools in India.

Engineering education in India has grown substantially in the past decade; both in number of students and number of colleges as shown in the table below.

Year	No. of degree colleges	Enrollments
97-98	562	134298
98-99	644	153151
99-00	755	179647
00-01	821	209115
01-02	1057	293814
02-03	1195	356258
03-04	1263	380803
04-05	1358	450954
05-06	1478	508595

Source: Annual report 2005-06, Dept. Sec. and High. Education, Ministry of Human Resource Dev., India

Despite this healthy growth rate, the average quality of the colleges and graduated students has become suspect. A survey of human resource professionals at multinational corporations in India revealed that only 25% of engineering students with a suitable degree could be employed irrespective of demand. Another survey of employers shows that only a handful of the 1400 engineering schools in India are recognized as providing world-class education with graduates worthy of consideration for employment. These results suggest that engineering degrees from most Indian colleges do not provide signaling value in the engineering labor market. Hence, low quality (in the labor market sense) engineering schooling has come to predominate in the education market. The recent growth in Indian engineering education has been mainly due to privately funded educational institutions. Table below shows the data for 2003 alone.

State	Govt.	Private
A. Pardesh	10	213
Assam	3	0
Bihar	4	3
Chattisgarh	2	9
Delhi	7	7
Gujarat	9	16
Haryana	7	29
H. Pardesh	2	3

Jharkhand	4	2
Karnataka	13	99
Kerala	31	51
M. Pardesh	6	47
Maharashtra	16	133
Orissa	6	38
Punjab	11	27
Tamil Nadu	16	234
U. Pardesh	25	58
Uttaranchal	5	4
West Bengal	15	37

The problem lies partly with the accreditation process in the Indian system not setting a sufficiently high standard to gauge the private colleges.

Status of higher education in Pakistan, on the other hand, is not clear. According to Higher Education Commission (HEC), Pakistan spent US$ 1 billion alone in sending its PhD scholars abroad for doctoral studies. The international scientific research publications increased from ~600 in 2001 to ~4200 in 2008. Around 50 new universities and degree-awarding institutes were established and enrolment in higher education increased by a factor of 3. But the critics have their own counter statistics. For example, according to the International Science Citation Index, the total number of times the research papers published in the 1998-2003 period were cited by other researchers was 2817 as against 1258 for the period 2003-2008 (excluding self-citations).

Engineering schools in Pakistan are accredited by the Pakistan Engineering Council and they are having a hard time to set identical standards to gauge public and private engineering schools within the country. Private sector universities like National University of Science & Technology and GIK Institute of Engineering Sciences & Technology need to do much more to become real school of technologies. Condition of public-sector engineering universities is no different.

In 2005, the McKinsey Global Institute conducted a study of the emerging global labor market and concluded that a sample of twenty-eight low wage nations, including China, India and Pakistan, had about 33 million young professional in engineering, finance and accounting at their disposal compared to only 15 million in a sample of eight higher wage nations, including USA, UK, Germany, Japan, Australia, Canada, Ireland and South Korea. But "only a fraction of potential job candidates could successfully work at a foreign company," the study found, pointing to many explanations, but mainly poor quality of education.

There were only 4 public sector universities in Bangladesh at the time of independence. Today the number has grown to 29 for public and 50 for private sector universities. Number of colleges providing higher education is around 1400. Still only about 12% of grade 12 graduates can enter into higher education. Absence of quality assurance

mechanism is a critical issue in Bangladesh. There is no provision for external review of quality for the universities. Bangladesh has recently developed a national Strategic Plan for Higher Education for next 20 years. The strategic plan recognized, among others, limited access, weak governance and management of institutions, and low quality of higher education are the major issues which need to be addressed.

Summarizing higher education needs considerable improvement in South Asia. Mega-sized projects for producing qualified junior faculty for universities and college are badly needed. Better institutional governance and management is needed. The impact of higher education in these countries would be enhanced significantly if the standard of education in the public sector universities and colleges could be improved. The need for improvement included broadening of education to include ethics, moral reasoning, civilizations and culture and extended facilities for vocational and technical education.

Jameel-Un Nabi is currently visiting the Abdus Salam International Centre for Theoretical Physics,Trieste, Italy. He is an Associate Professor of Physics at the GIK Institute of Engineering Sciences and Technology, Pakistan

In the News

ENSF supported research becomes a success story worldwide

An ENSF supported post-doctoral fellow, M. Jamil Aslam, from the Quaid-i-Azam University, Islamabad, Pakistan, working under the leadership of Professor Ahmed Ali from DESY, Hamburg, Germany, is junior co-author of a joint paper with Professor Ahmed Ali and his graduate student Christian Hambrock, on tetraquarks suggesting the existence of a new form of matter, in the prestigious *Physical Review Letters* of 23 April 2010. Professor Ahmed Ali is the Chairman of M.A.B. Beg Physics Prize Committee instituted by ENSF.

The story goes back to 2008 when researchers on the BELLE experiment at the KEK laboratory in Japan studied the decay scheme of excited state of the meson "bottomonium". The results were based on a data sample of 21.7 fb^{-1} collected with the Belle detector at the KEKB e^+e^- collider. The Belle Collaboration found out that one particular decay channel was more than two orders of magnitude larger than for the other decay channels. The unexpectedly large partial widths disagree with the expectation for a pure (bbar) state, unless there is a new mechanism to enhance the decay rate. The recent discovery of Y(4260) decaying with an unexpectedly large partial width has brought new challenges to the interpretation of its composition. Among the possibilities are the "hybrid" quark-anti-quark-gluon and tetraquark states.

Two years later, Professor Ahmed Ali and his research group proposed an alternative, rather extraordinary explanation to this observed anamoly. The team headed by Ahmed Ali, including his PhD student Christian Hambrock from DESY and M. Jamil Aslam from Pakistan, presented a dynamical model based on the tetraquark interpretation of $Y_b(10890)$ and thereby brought excellent agreement with the experimental data observed in the decay studies of Belle Collaboration. They proposed that instead of producing bottomonium, the Belle Collaboration created a new particle containing four quarks and were anlayzing its subsequent decays. All hadrons could be described in terms of their

constitutent quarks. Mesons form a bound state of a quark-antiquark pair, whereas baryons (including protons and neutrons) are made up of three quarks or antiquarks. Howeveer, QCD allows other, exotic bound states to exist. Tetraquarks is one such possibility which comprises of two-quarks and two antiquarks known as diquarks and antidiquarks. Tetraquarks have well-defined properties, characterized by their color and electromagnetic charges, spin and flavor quantum numbers. Tetraquark hadrons are singlets in color and can participate as physical states in scattering and decay processes. Speculations for the existence of tetraquraks were ongoing for decades. However, in recent years state-of-the-art experiments are becoming sensitive enough to see possible signatures of such exotic particles and led to the rejuvenation of the possible existence of tetraquark matter.

The proposal of this new form of matter, by Ali and collaborators, has captured lot of attention of media as well. Numerous newspapers and scientific magazines world-wide were fascinated by this exotic form of matter. However, one should not be carried away by the enormous specualtions surrounding the tetraquarks. A number of measurements has to be undertaken to confirm the tetraquark interpretation of the Belle anamoly. Work is currently in progress by the Belle Collaboration in this direction. Related studies are also due in Super-B factories planned at KEK (Japan) and Frascati (Italy). The two big hadron colliders, Tevatron and LHC, also have the capacity to measure tetraquark states. Only time will be able to tell us if tetraquraks really exist. (News item submitted by Jameel-Un Nabi)

Contacts

Sheila Khawaja
The Emerging Nations Science Foundation
Viale Miramare 129
34136 Trieste, Italy
Email: info@ensf-ngo.org.