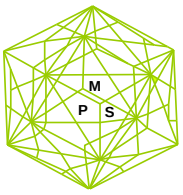
Pakistan Mathematical Society

Editors
Malik Abdur Rauf
Muhammad Irfan Ali

News Letter
Issue No7, April 2004



Editorial

Over the years, several damaging trends have developed in mathematics in Pakistan, which are a hindrance to the development of mathematics in the country. One of these is the utilitarian approach towards mathematics. There is too much emphasis on the development of mathematics, which can be used for research, and development of our industry and science and technology.

Novel mathematics is not amenable to an industrial research and development approach. But the results pay for all the effort by their durability and versatility. It is dangerous to have an industrial approach towards mathematics or any other science for that matter. We should not expect every result of mathematics to be usable in everyday life. Such an attitude is harmful for creativity, which demands the full mental activity of a mathematician without any social, economic, or psychological constraints.

Most people, even some cultivated scientists, think that mathematics applies because you learn a theorem and the theorem some how mysteriously explains the laws of nature. That does not happen even in science fiction novels. The results of mathematics are seldom directly applied; it is the definitions that are really useful. What applies is the mathematical ability that one learns through hard work and cultural background, not the specific theorems taught in the subject.

There should not be such a sharp distinction between pure and applied mathematics. At least keeping in mind the kind of mathematical research that is being done in Pakistan. One needs extraordinary wisdom and competence to draw the line of 'usefulness'. Such a division or controversy in mathematics is decreasing its utility and research activity.

The concerted efforts are made to provide an academically vibrant and intellectually stimulant mathematical material by exploring different resources in the succinct form to maintain and revive the level of interest in the multiple branches of applied and pure mathematics.

To maintain the dynamics, the worthy readers are requested time and again to provide material for publication in the PMS Newsletters for the benefit of the mathematical community in Pakistan. Your valued article will be a source of inspiration for those who are interested in developing a viable mathematical culture in Pakistan.

Editors

Princeton: A World Centre for Mathematical Research

It is highly challenging and intellectually inspiring to read the emergence of Princeton University described by William Aspray. The significant contributions, personal and dedicated efforts by the University staff are highly appreciable by their consistent efforts in the field of academics especially in mathematics. Princeton changed the status of university from the college of New Jersey in 1896. At the time, Princeton, like other American Universities, was primarily a teaching institution and made a few contributions to mathematics. Just four decades later, by the mid- 1930's, Princeton had become a world center for mathematical research and advance education. Let us examine some of the social and institutional factors that were instrumental for this rapid rise to excellence. In 1939 the entrance of United States in world war II, Princeton had the unique atmosphere of an exclusive and highly productive mathematical club. The social environment changed after the war with increase in university personnel and move of the institute to separate quarters, and uniqueness was challenged by the improvement of the mathematical research and advance education at the other American institutions. Efforts to establish a research program at the Princeton University began in the first decade of the twentieth centaury at the hands of Henry Burchard Fine. Fine traveled to Leipzig in the spring of 1884 to study with Felix Klein. Fine returned to Princeton in the fall of 1885 as an Assistant professor of mathematics with an admiration for the German system, which provided opportunities for young mathematicians to work closely with established researchers.

Fine published several research papers in geometry and numerical analysis and he was most prominent as a textbook writer. There was time when mathematics department had only eight staff members – non-more distinguished a researcher than Fine. Undergraduate teaching loads were heavy, salaries low, and opportunities for research limited. The department had an office in the library, under these conditions the individual faculty members had to work at home. Between 1905 and 1925 many of the young mathematicians who were to become leaders in American mathematics were members of Princeton faculty. Princeton was beginning to collect mathematical talent that of rivaled established world center; Gottingen, Berlin, Paris, Cambridge, Harvard, and
Chicago.

In 1924 there were only seven members who were engaged in mathematical research. Situation began to change around 1924 when an effort was made to raise funds to support mathematical research. Playing to the desire of the funding organizations to build strong American research institutions and it is to be noted that a teacher has to teach nine to fifteen hours a week as compared with three hours by the mathematician in the college de France. Whereas for the researchers the teaching duties could have been limited or not required. It was proposed that an institute consisting of a balance group of first rank productive mathematicians who have opportunities for mathematical research comparable with the opportunities ordinarily given those who conduct research, and train research workers. It was envisioned that four or five senior mathematician would devote themselves entirely to the research and to the guidance of research of young men. By 1928 the university has raised the $2 million through alumni's, and one fifth of the total amount was made available to the mathematics department. It was used to buy material, support the general Annals of mathematics, reduced teaching load, and pay salaries of teaching mathematicians.

Princeton was able to provide full financial support for doctoral and postdoctoral mathematician in the late 1920's and the 1930's. It attracted more national research council fellows than any other US university. British and French student were supported by common wealth and proper fellow ship program and American graduate students by the university funds.

Flexner and Veblin assemble an impressive international group of research mathematician. Alexander was established topologist. Einstein was already world known for his contribution to theoretical physics. Morse was an accomplished Harvard mathematician known for his research in "analysis in the large". Veblin was the senior American geometer. Von Neumann was a brilliant young mathematician who had already made major contribution to logic, quantum mechanics and analysis. Weyl was known to posses the widest range of mathematical knowledge. The institute had many visitors each year and a few research associates like Kurt, Godel, but these constituted the regular faculty for the school of mathematics for about 10 years.

Veblin envisioned a place where promising young PhD's and established young mathematicians could interact and pursue common mathematical research interest without interruption by undergraduate teaching or other routine faculty duties. To that end he arranged for adequate funds for visitors, including funds for many young PhD's to work as research assistant of the permanent institute faculty.

Another factor was the editing of professional journal "the Annals of mathematics and studies, journal of symbolic logic, and Annals of mathematical statistics" at Princeton. They provided the faculty and their students with an outlet for research and gave the faculty some control over the direction of American research. These journals also provided extensive contacts with wider mathematical community and a vehicle for scouting new talent for appointments. Financial support for graduate students and visitors and for reduces teaching loads of staff also promoted the growth of large community focused on mathematical research. The success in Princeton is even more remarkable when it is considered occurred at the same time at great depression and the growth of Nazism. General economic circumstance seriously depressed economic salaries. Limited funds for graduates and postdoctoral support and restricted job replacement for Princeton, PhD's and junior faculty was under the major crises at that time. The political disruption of European academics resulted in an influx of European mathematicians into the United States. Further straining the appointment and promotion of American-bred and trained mathematicians.

By going through the different phases of development one can visualize the hardships and pressures through which the mathematicians had been working and made tremendous and significant contributions in the diverse filed of mathematics. This was because of their optimum commitment and devotion to the cause of mathematics in particular and academics in general. We must concretize the noble ideas presented in the article and appreciate the indigenous and pragmatic approach, which will serve as beacon for the rest of the world.

Teachers Training Programme

A teachers training programme was organized by the Federal Directorate of Education Islamabad for the teachers teaching mathematics at secondary level. The programme was aimed to train

about one hundred teachers of mathematics. The participants were divided into two groups P1 and P2. Training of the P1 group was to start on 1st June 2004 but unfortunately the programme had to be postponed indefinitely. The new date for the start of the programme will be announced soon.

Mathematical Journals available at QAU

The mathematics library at Quaid-i-Azam University has improved considerably recently. The researchers at Quaid-i-Azam University in particular and in Pakistan in general can now have access to twenty-four reputed mathematical journals now available in the Library. The list of the journals is given below.

1 Archives of Mechanics
2 South East Asian Bulletin of Mathematics
3 Canadian journal of Mathematic
4 General Relativity and Gravitation
5 Glasgow Mathematical Journal
6 Journal of Mathematical Physics
7 Manuscript Mathematica
8 Quarterly Journal of Mathematics
9 Semi group Forum
10 Journal Mathematics of Kyoto University
11 Osaka Journal of Mathematics
12 International Journal Nonlinear Mechanics
13 Acta Mechanica
14 Classical and Quantum gravity
15 Journal of Fluid Mechanics
16 Quarterly Journal of Applied Mathematics and Mechanics
17 International Journal of Engineering Science
18 Applied Mathematics and computation
19 Journal of non-Newtonian fluid Mechanics
20 Acta Mechanica Sinica
21 Journal of Group theory
22 International Journal of commutative Ring theory
23 Journal of fuzzy mathematics
24 Journal of Algebra

Dr. Noor Muhammad (1951 - 2004)

Dr. Noor Muhammad passed away on 12th April 2004. He was a notable Pakistani mathematician. He was born on 15th April 1951. He hailed from Haripur district Abbotabad. He graduated from the University of Peshawar in 1971 with mathematics and Physics as his major subjects. He obtained his masters degree in mathematics in 1973 from Quaid-i-Azam University, Islamabad. In pursuance and lust for knowledge he joined Moscow State

University, Russia for his PhD from 1979-83. His main area of research was a branch of Functional Analysis, namely C*-Algebras.

Out of his PhD thesis, he produced some interesting research papers on elliptic pseudo-differential operators over C*-Algebras for compact manifolds from his. He was a postdoctoral fellow at Abdus Salam International Centre for Theoretical Physics Trieste, Italy. He also worked on P-Commutative Topological Algebras in collaboration with late Professor A.B. Thaheem and it is reproduced in the book "Symmetric Topological Algebras and Applications" by Maria Frgoulopoulou, University of Munster, Germany. He has published papers on topics in approximation theory, derivation on topological algebras and multipliers of topological algebras. Dr. Noor Muhammad has supervised fifteen M.Phil. students at Quaid-i-Azam University. His untimely death is an irreparable loss to the nation and the mathematical community in Pakistan.

Professor A.B. Thaheem (1945 - 2004)

Professor A.B. Thaheem, an eminent Pakistani mathematician passed away on 30th January 2004. He specialized in Spectral Theory, which is an important branch of Functional Analysis. His several research papers of excellent quality were published in the international journals of high repute. He supervised many M.Phil. students during his stay at QAU. He supervised doctoral research of Professor Muhammad Aslam, now Professor at G.C.University, Lahore.

He was born on 2nd June 1945 in Jhang district and graduated from Government College Jhang in 1966. He joined the University of Punjab to complete his Masters in Mathematics in 1968. He pursued his higher studies in the University of Leuvn Belgium and was awarded Ph.D. degree in 1975. His PhD thesis was on 'One parameter Groups of Automorphisms of Von Neumann Algebras'. He joined QAU in 1985 and was promoted to the post of professor in 1992. Later, he proceeded to Saudi Arabia to join King Fahad University of Petroleum and Minerals (KFUPM). He died while he was on vacations from KFUPM and was visiting his hometown in Jhang.

Mrs. Iffat Sarwar (1950 - 2004)

Mrs. Iffat Sarwar, wife of Professor Dr. M. Sarwar Kamran, passed away on 2nd November 2003. Her untimely and unexpected death has shaken the family. Miss Iffat Mufti, born in Gujrat and brought up in Sialkot belonged to a well-respected Mufti family of Gujrat. She became Mrs. Iffat Sarwar in 1971, when she was married to Professor Kamran, an intellectual, scholar, mathematician, and an outstanding poet of national stature.

She herself was a committed educationist. She graduated from University of the Punjab, Lahore and later specialized in thread work, doll making, fret work, painting, and textile designing. She had the opportunity to work closely with Mrs. Anna Molka Ahmad who was appreciative of her talent in these arts. She joined Government Girls Higher Secondary School, Rawalpindi in 1973. She remained an active member of the teaching staff at the school until her death.

She had the opportunity to travel to Nigeria with her family and stayed there for about five years from 1978 to 1983. Later, she traveled with her husband to the USA and the UK. Motivated by her love and affection to visit the holy places in Mecca and Medina, she performed haj with her family twice respectively in 1981 and 1983. She has left behind her loving husband, two sons (doctor and engineer) and a daughter (doctor).

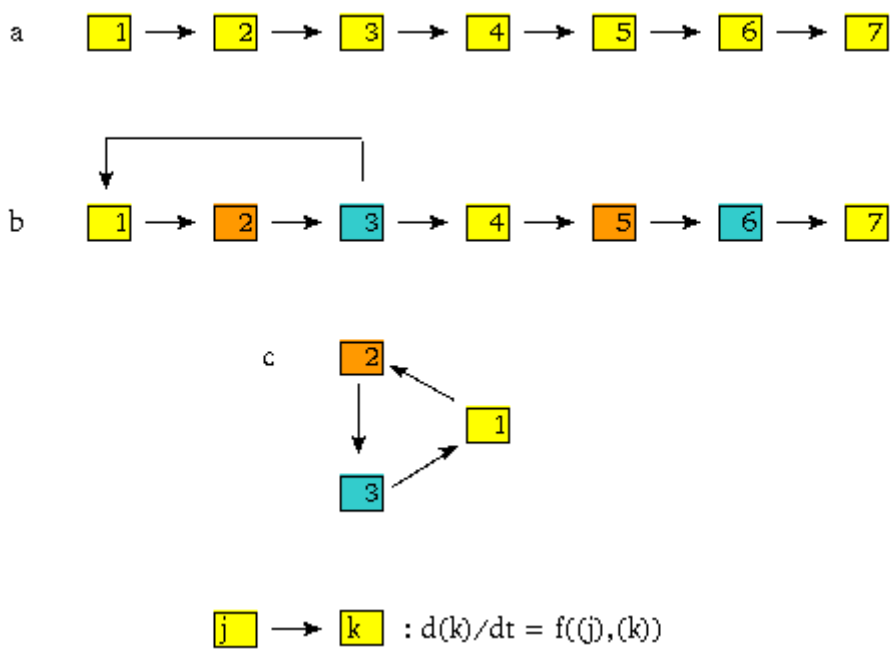
Repairing Rift between the worlds of Pure and Applied Mathematics

The Norwegian Academy of Science and Letters has decided to award the Abel Prize for 2004, jointly to Sir Michael Francis Atiyah, University of Edinburgh and Isadore M. Singer, Massachusetts Institute of Technology. Atiyah and Singer will receive the prize "for their discovery and proof of the index theorem, bringing together topology, geometry and analysis, and their outstanding role in building new bridges between mathematics and theoretical physics."

The Atiyah-Singer index theorem is one of the great landmarks of twentieth century mathematics, influencing profoundly many of the most important later developments in topology, differential geometry and quantum field theory. Its authors, both jointly and individually, have been instrumental in repairing a rift between the worlds of pure mathematics and theoretical particle physics, initiating cross-fertilization, which has been one of the most exciting developments of the last decades.

Groupoids and the Leech Heart

The heart of the leech *Hirudo medicinalis* beats to a rythm of its own. There are two disjoint tubes, running most of the length of the creature's body, each partitioned into 16 connecting chambers. In one of the tubes, all the chambers contract synchronously; in the other the contractions are staggered so as to produce traveling waves. Every 50 beats or so (about every 25 minutes), the two tubes trade roles. "This curious pattern is coordinated by a small nework of neurons at the rear of the animal," we learn from Ian Stewart in a piece ("Networking Opportunity") he contributed to the February 12 2004 *Nature*. The problem in *network dynamics* is to understand "how the network architecture produces the distinct coordinated states and switches between them." And one of the mathematical tools that has proved useful in problems like this is the theory of groupoids, "the ideal tool for describing symmetries that apply only to parts of systems." For example, network **c** in the figure is completely symmetrical, and is consequently acted on by the group of cyclic permutations of the nodes. Network **b** is not symmetrical. But if we examine the "input sets -- all nodes that emit an arrow pointing to a given node" then there is a symmetry: each node has a one-element input set, and the nodes can be partitioned into equivalence classes. For example **1** is equivalent to **4**, since they both have a single input from **3**. Then **2** and **5** are equivalent, since they each have an unput from the {**1**,**4**} set. Likewise **3** and **6** are equivalent; finally **7** must fall in the equivalence class of **1** and **4**.



This diagram is adapted from Stewart's article. Network **a** is unsymmetrical: node **1** is functionally different from the others. The modified network **b** is still geometrically unsymmetrical, but admits a projection onto a *quotient network* **c** with three symmetrical states.

This partition into equivalence classes can be called a *synchrony*; in fact the equations of network **b** admit a solution in which equivalent nodes are synchronized. Groupoids come into the picture, Stewart tells us, when we try to work out "all robust patterns of synchrony in a network." The synchrony in network **b** gives rise to a traveling wave of excitations, propagating down the tail of the network. If the network were modified again so that the feedback arrow led from node **1** to itself, then all the nodes would be in a single equivalence class, and the solution to the network equation would have all nodes acting synchronously. "Qualitatively these two patterns resemble those observed in the leech heartbeat ..."
(From internet)

Love Model Equations

The 13th February *Seattle Times* reported that a local team of psychologists and applied mathematicians has presented no less than a "mathematical formula for marital bliss." Unfortunately this formula, derived by John Gottman, James Murray, Kristin Swanson and their collaborators, is not an algorithm for achieving bliss. Rather it is a mathematical model of a relationship, based on the analysis of how a couple interacts when arguing, that can predict "with 94 percent accuracy which marriages will last and which will end in divorce." The model is a set of "coupled" first-order ordinary differential equations. In

LoveModelEquations-2.pdf (available from the online *Seattle Times* article) Swanson spells them out:

Rate of change of husband's score		Husband's emotional inertia	Deviation from husband's uninfluenced steady state		Influence of wife on husband's score
$\frac{dx}{dt}$	=	q_1	$(x_0 - x)$	+	$I_1(y)$

Rate of change of wife's score		Wife's emotional inertia	Deviation from wife's uninfluenced steady state		Influence of husband on wife's score
$\frac{dy}{dt}$	=	q_2	$(y_0 - y)$	+	$I_2(x)$

Here I_1 and I_2 are piecewise linear functions (two different positive slopes, changing at 0) which encode the couple's argument-interaction behavior. Geometrically speaking, the health of the relationship can be read off from the convexity of I_1 and I_2. Both close to straight lines give a "validating style of interaction." Both are very convex downward in conflict-avoiding couples, very convex upward in volatile couples. We are not told the prognosis for a mixed marriage. (From Internet)

5th International Pure Mathematics Conference 2004

The 5th Pure Mathematics Conference 2004 is the continuation of the series of pure mathematics conferences held in 2000, 2001, 2002 and 2003. It is the joint venture of Quaid-i-Azam University and the Pakistan Mathematical Society. It will be held in Islamabad during 20-22 August 2004 and is organized by the Mathematics Department of QAU and PMS.

To acquaint the mathematical community with the latest trends in Pure Mathematics, the Pakistan Mathematical Society has organized the 1st, 2nd, 3rd and 4th Pure Mathematics Conferences in 2000, 2001, 2002 and 2003 respectively. In order to join the ranks of advanced nations, an appropriate strong base in fundamental research in mathematics is a necessary impetus for economic growth, technological advancement and scientific activity. The primary aim of organizing such conferences is to enhance the understanding of the

targeted subject and to provide opportunity to the working mathematicians to exchange ideas with their colleagues at the national as well as international level.

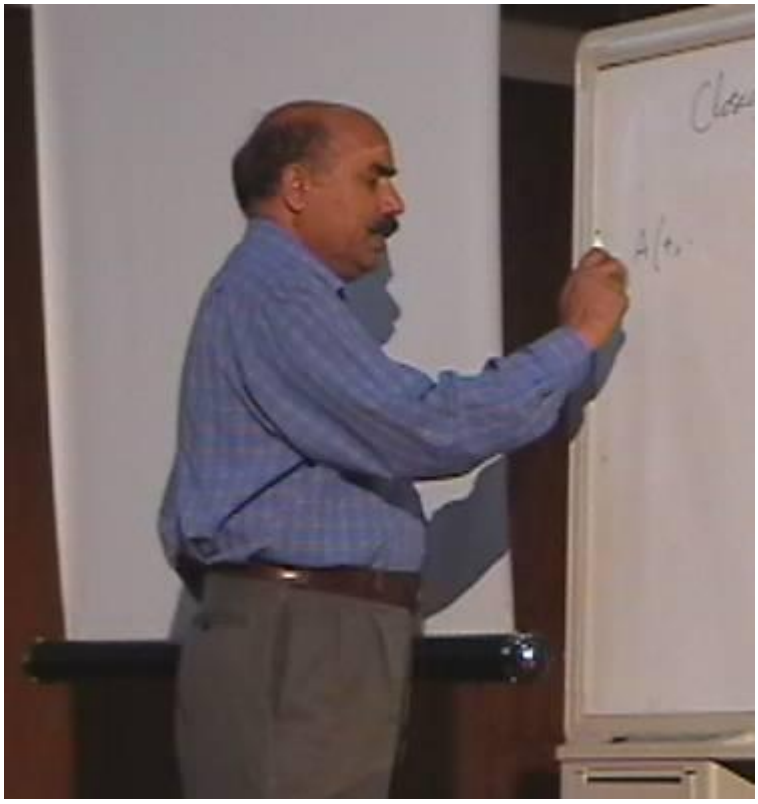
The 5th Pure Mathematics Conference 2004 will be on **Algebra, Analysis, Geometry and** Mechanics. It will add an international dimension to research in the fundamental branches of mathematics in Pakistan and will give the opportunity to our budding mathematicians to have a permanent liaison with their eminent colleagues at the international level.

Organizing Committee	**International Steering Committee**	
Professor Qaiser Mushtaq (Convener)	Prof.D.A.Buchsbaum	USA
Professor B.A.Saleemi	Prof.B.K.Das	India
Dr. Muhammad Shabir	Prof. M.Deza	France
Dr. Arshad Mahmood	Prof. W.A.Dudek	Poland
Mr. Muhammad Sarwar Saeed (Secretary)	Prof. Q. Mushtaq	Pak
Mr. Muhammad Ali	Dr. S.E.Rees	U.K
Mr. Muhammad Aslam	Prof. K.P.Shum	HK
Major Muhammad Ashiq	Prof. D.A.R.Wallace	U.K

For further information,

Contact: **secretary@pmc.org.pk, mssaeed@ma.hw.ac.uk**,
Phone: +92 (0) 51 2873008, +92 (0) 300 5152353, +44 07932 412 635
Fax: +92 (0) 51 444 8509

Registration is open and is available in both paper based and online formats. For online registration, visit the conference website at the URL:http://www.pmc.org.pk
E-mail:info@pmc.org.pk



Dr.Noor Mohammad giving a lecture at 3rd PMC 2002 at AIOU

Professor A.B.Thaheem chairing a session at 3rd PMC 2002 at AIOU