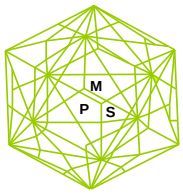
Pakistan Mathematical Society

Newsletter



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EDITORIAL

Mathematics is the most misunderstood branch of science in Pakistan. Almost all prefaces and forewords of books, prospectuses and compendiums contain phrases like ‘mathematics is the queen of sciences’, ‘ it is a servant of science’, ‘it is an art’, and ‘it is a beauty’ without inkling what these terms mean really. People who use these terms do not understand them in the first place. They are unaware of their pernicious effects if they are used in an improper perspective.

Policy makers who generally are non-mathematicians are understandably unaware of the true nature of mathematics. They therefore seek the help of so-called mathematicians. But unfortunately, many mathematicians are not well read. They generally perceive mathematics as a quantitative science. Besides, they get carried away with the ‘salesman’s approach’ and highlight only a side effect of mathematics, mainly ‘the applications of mathematics’ and thus undermine the real mathematics and the very purpose of it.

They thus misguide the policy makers who inadvertently make policies, which suit only a very small part of mathematics. The true nature of mathematics therefore gets ignored in their policies. Those who work in the real mathematics thus get neglected. Their teaching and research is undermined.

As a consequence only a few branches of mathematics have flourished in Pakistan since 1947. Many important and necessary branches of mathematics have even vanished. Therefore, the development of mathematics has not been multidimensional. Fundamental research has been adversely affected.

Thus there is an urgent need not only to realize the true nature of mathematics but also propagate it to the policy makers. Recent times have seen an over production of researchers in mathematical modelling in fluid mechanics and astrophysics. They are publishing their research mostly in non-mathematical journals. It is on record that applied mathematicians in Pakistan are now publishing papers in engineering and physics journals. Almost none of them are publishing research in mainstream mathematical journals.

The desire for quick publication of research papers in journals with high impact factors has compelled researchers to publish in non-mathematical journals. As a result their research is unnoticed by the international mathematical community.

THE ABEL PRIZE FOR 2005

The Norwegian Academy of Science and Letters has decided to award the Abel Prize for 2005 to Professor D.Lax, Courant Institute of Mathematical Sciences, New York University, for his groundbreaking contributions to the theory and application of partial differential equations and to the computation of their solutions.

Ever since Newton, differential equations have been the basis for the scientific understanding of nature. Linear differential equations, in which cause and effect are directly proportional, are reasonably well understood. The equations that arise in such fields, as aerodynamics, meteorology and elasticity are nonlinear and much more complex: their solutions can develop singularities. Think of the shock waves that appear when an airplane breaks the sound barrier.

In the 1950s and 1960, Lax laid the foundations for the modern theory of nonlinear equations of this type (hyperbolic systems). He constructed explicit solutions, identified classes of especially well behaved systems, introduced an important notion of entropy, and, with Glimm, made a penetrating study of how solutions behave over a long period of time. In addition, he introduced the widely used Lax-Friedrichs and Lax-Wendroff numerical schemes for computing solutions. His work in this area was important for further theoretical developments. It has also been extraordinarily fruitful for practical applications, from weather prediction to airplane design.

Another important cornerstone of modern numerical analysis is the "Lax Equivalence Theorem". Inspired by Richtmyer, Lax established with this theorem the conditions under which a numerical implementation gives a valid approximation to the solution of a differential equation. This result brought enormous clarity to the subject.

A system of differential equations is called "integrable" if its solutions are completely characterized by some crucial quantities that that do not change in time. A classical example is the spinning top or gyroscope, where these conserved quantities are energy and angular momentum.

Integrable systems have been studied since the 19^{th} century and are important in pure as well as applied mathematics. In the late 1960s a revolution occurred when Kruskal and co-workers discovered a new family of examples, which have "solution" solutions: single-crested waves that maintain their shape as they travel. Lax became fascinated by these mysterious solutions and found a unifying concept for

understanding them, rewriting the equations in terms of what are now called “Lax pairs”. This developed into an essential tool for the whole field, leading to new constructions of integrable systems and facilitating their study.

Scattering theory is concerned with the change in a wave as it goes around an obstacle. This phenomenon occurs not only for fluids, but also, for instance, in atomic physics (Schrödinger equation). Together with Phillips, Lax developed a broad theory of scattering and described the long-time behaviour of solutions (specifically, the decay of energy). Their work also turned out to be important in fields of mathematics apparently very distant from differential equations, such as number theory. This is an unusual and very beautiful example of a framework built for applied mathematics leading to new insights within pure mathematics.

Peter D. Lax been described as the most versatile mathematician of his generation. The impressive list above by no means states all of his achievements. His use of geometric optics to study the propagation of singularities inaugurated the theory of Fourier Integral Operators. With Nirenberg, he derived the definitive Garding-type estimates for systems of equations. Other celebrated results include the Lax-Milgram lemma and Lax’s version of the Phragmen-Lindelof principle for elliptic equations.

Peter D. Lax stands out in joining together pure and applied mathematics, combining a deep understanding of analysis with an extraordinary capacity to find unifying concepts. He has had a profound influence, not only by his research, but also by his writing, his lifelong commitment to education and his generosity to younger mathematicians.

PERNICIOUS IMPACTS OF IMPACT FACTORS IN PAKISTAN

Qaiser Mushtaq

The use of impact factors and citations count has mixed effects. In certain areas of science its effects are very welcome. Many scientists in Pakistan have received huge amounts as rewards for their research papers. Several scientists have received Civil Awards and have been elected as Fellows of the Academy of Sciences.

However, the effects on mathematics have been discriminatory effects. Foreseeing the pernicious effects on mathematics, Professor Mushtaq began his struggle against the misuse of impact factors. He wrote several articles in newspapers, wrote letters to Professor Atta ur

Rahman (the founder of use of impact factors in Pakistan), and other high officials. In 2001, he won a favourable decision from the Federal Ombudsman. Pakistan Mathematical Society is playing its role in trying to convince Professor Atta ur Rahman to stop the use of impact factors and citations count in mathematics.

While expenditure on science and technology has increased, it is understandable that we make sure at the same time that the money spent is well utilized and the objective is achieved. We therefore have to evolve an adequate system of assessment. One way to assess the quality of our highly educated work force is to monitor their research. We have suggested a number of modifications in the existing system of assessment, namely, the use of impact factors and citations count. Many a time it has been illustrated that the use of impact factors and citations count is misleading and defective.

The effects of the misuse of the impact factors and citations count are already visible now. Fake multiplicity in authorship of research papers has increased. Even a research paper taken out of a dissertation or thesis has co-authors other than the supervisor and the author of the dissertation or thesis, which implies that the supervisor has pleased his "friends" by letting them share the work of his student. Or it could also mean that the supervisor has sought the help of his "friends" in producing an M.Phil. or a Ph.D. student.

Another problem evident from the research publications themselves is that applied mathematics have started publishing in journals of physics and engineering because these journals have higher impact factors and faster speed of publication. They are unable to produce qualitative research work, which can be acceptable in internationally well-reputed journals of mathematics. They have found an easy and profitable way out. As a consequence their work is not getting any place in mainstream of mathematics.

Fast production per year of research papers in highly un-natural. Authors who cannot write one correct sentence in English are producing 2 to 3 research papers per month. The papers contain re-churned and rehashed work. In some cases the increase in paper production is a result of self-mimicking.

Introduction of a condition that at least one research paper published or accepted in a journal with a non-zero impact factor to qualify for a Ph.D. degree from a Pakistan university will adversely affect those who are interested in publishing a paper in a mainstream mathematical journal. The desire to publish one's research work in a good mathematical journal will be overpowered by the ground reality to

publish in a non-mathematical journal for speedy publication with a high non-zero impact factor.

Young mathematicians who are producing good research papers and are trying to publish in mathematical journals have been deprived of the showers of financial benefits pouring down from the HEC on applied mathematicians. For instance since 1999, only three mathematicians have been elected as fellows of the Pakistan Academy of Science. Another interesting observation is that since 1999 of the four persons who have received civil awards, three of them are the same who were elected fellows of the Academy of Sciences.

Recently, there was a letter from COMSTECH, Islamabad, asking Pakistani mathematicians with cumulative impact factor more than 40 to submit their curriculum vitae for inclusion in the directory of scientists in the OIC countries. One can of course guess who these mathematicians would be – they all are applied mathematicians and same *ranjahs*.

The situation vis-à-vis mathematics will further deteriorate. Many important branches of mathematics will further vanish. Real mathematics with applications is already neglected and it will lose its credibility further in the future. So-called applied mathematicians are pretending that their work is applicable which in fact, an expert can easily see, is not the case.

MATHEMATICAL RESARCH RECORDED

Qaiser Mushtaq

Mathematics is one of the oldest disciplines of knowledge. It is perhaps as old as the concept of by-symmetry. According to H.Weyl, old figures, carvings and drawings in caves depict that the concept of by-symmetry used to exist before the concept of numbers. The concept of numbers was most probably a gradual awareness, which may have developed some 300,000 years ago. Because of its old history, mathematics is rich in substance.

Mathematics encompasses almost every branch of human knowledge. As civilizations developed mathematics also grew. The growth was rapid. Its development was both vertical and horizontal and consequently it had to be split into different groups. I.Stewart says that by Pythagoros' time, mathematics was already divided into ten various sub-disciplines, namely, Discrete, Continuous, Absolute, Relative, Static, Dynamic, Arithmetic, Music, Geometry, and Astronomy.

Knowledge continued growing at a phenomenal pace. According to the experts, the first doubling of knowledge took place in 1750 to be followed by the second doubling in 1900, and the third doubling in 1950. Since 1950, the redoubling of knowledge has been occurring after each decade. As knowledge grew manifold, mathematics also grew faster than perhaps its contemporary branches of knowledge. The rate of increase in the volume of mathematical knowledge, the increase in its complexity, and sophistication forced mathematicians to work in a specialized area of their interest. The creation of specializations within mathematics has accelerated to the point where it became necessary to classify these specializations globally and systematically. Not only was this inevitable, but it has also helped researchers in many ways. Therefore, the result of this remarkably useful endeavor is that mathematics is now classified into 63 main branches and 3,625 sub-branches.

Due to the standardization of subject classification, not only has repetition and plagiarism in mathematical research been minimized but unimportant digressions from the mainstream of mathematical research have been curtailed as well.

As most people in the mathematical research community are aware, there is a revolution taking place in the way information – in particular mathematical research – is being produced and disseminated throughout the world. Although research in mathematics has become extremely technical, it is ever growing. With the passage of time, it has become impossible to read all papers in one's field of research. Therefore, there was a need to make available short reviews of papers published all over the world so that it can become convenient for the researchers to select papers of their interest for study by reading their reviews first.

In 1931, O.Neugebauer founded Zentralblatt fur Mathematik and later in 1939 O.Neugebauer, J.D.Tamarkin, and O.Veblen founded yet another such journal called Mathematical Reviews. These publications were taken out by Springer-Verlag and the American Mathematical Society respectively. During most of the twentieth century these journals have aided mathematicians in finding and evaluating the exponentially growing amount of research literature.

Mathematical Reviews and Zentralblatt fur Mathematik are the journals of record which review and abstract the published mathematical research literature. Reviewers are assigned from amongst 12,000 mathematicians around the world. Some 40,000 to 47,000 reviews or abstracts are published each year. Mathematical Reviews and Zentralblatt fur Mathematik are published every month,

each issue containing on the average about 3,500 to 3,900 abstracts or reviews. Since their founding, these publications have aimed to serve researchers and scholars in the mathematical sciences by providing timely reviews or summaries of articles and books that contain new contributions to mathematical research, and by providing indexes and accurate bibliographic information.

Items in these two publications are classified using the 2000 Mathematics Subject Classification (MSC' 2000), which can be found in the 1995 Annual Index and on e-MATH. An author "lookup" feature is available on e-MATH (http://www.ams.org/committee/publications/author-lookup.html); for a given author name, it provides a list of Mathematical Reviews numbers for papers since 1941.

Each review of a paper not only highlights the major result(s) in the paper but also provides the following useful information: name of the author (and co-author(s) if any), address, the name of the journal where the research paper has been published, Mathematics Subject Classification Number, Number of reviewed papers so far and sometimes, Reviewer's comments. It also means that the paper is published in one of the 1,500 journals which are considered worth inclusion in the Mathematical Reviews and/or Zentralblatt fur Mathematik.

CONFERENCES AND WORKSHOPS

Summer Conference in Mathematics 30 – 31 July 2007

Centre for **A**dvanced **S**tudies in **M**athematics, LUMS is organizing Summer Conference in Mathematics for two days (30th and 31st July 2007). The main motivation for this conference is to promote interaction between researchers and generate cross-fertilization of ideas in various sub specializations of Mathematics. Registration is FREE, but participation is by invitation only.

Organizing Committee: M. Aslam Butt (Convener), M. Naeem Qureshi, M. Yaseen, Asma Rashid Butt, Kashif Nazar.

Venue: Lahore University of Management Sciences (LUMS), Lahore.

Symposium on Euler

A symposium will be held at the auditorium of the Pakistan Science Foundation (PSF) on 12 June 2007 to mark the 300th birth anniversary of the renowned Swiss mathematician, Leonhard Euler. The chief

guest at the occasion will be the deputy head of the Swiss Embassy in Islamabad.

Petra International Conference on Mathematics,
Jordan

The preparatory committee of Petra International Conference on Mathematics is pleased to invite you to participate in the conference to be held at Al-Hussein Bin Talal University, Jordan, Oct 23-25, 2007. Papers from all areas of mathematics and statistics stated below are very welcome. Selected (refereed) papers will be published in a special volume of the conference proceedings.

Besides the academic activities, the organizers will arrange tours to some wonderful places in Jordan including Petra itself. The hosting institute, Al-Hussein Bin Talal University, will support generously all costs except tickets to/from Jordan.

The objectivities of the conference are to provide a precious opportunity to present the latest theoretical research results and new advances in all areas of mathematics and statistics to a wide audience of distinguished professors and students who work in different disciplines, to develop stronger ties among them, and to discuss questions of great current interest, and to suggest open problems.

8th International Pure Mathematics Conference 2007
24 – 26 August 2007, Islamabad, Pakistan

The 8th International Pure Mathematical Conference 2007 (8th IPMC 2007) is the 8^{th} international conference in the series of Pure Mathematics Conferences that take place in Islamabad every year in August. It is a thematic conference on Algebra, Geometry, and Analysis held under the auspices of the Pakistan Mathematical Society. There will be free housing for local participants. Several recreational trips will be organized in and around Islamabad introducing the unique local and multi-ethnic culture.

Please fill in the on-line registration form at www.pmc.org.pk and find more information therein. The conference is convened by Professor Dr Qaiser Mushtaq in collaboration with Quaid-i-Azam University and Preston University. It is supported by the Higher Education Commission, Pakistan Science Foundation, and Currentage International Marketing (Pvt) Ltd.