

Preface

Being inexhaustible, life and nature are a constant stimulus for a creative mind.

– Hans Hofmann (1880–1966)

German-born American abstract expressionist painter

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After the setting up of the Institute for Mathematical Sciences (IMS) of the National University of Singapore (NUS), Louis Chen, who became its founding director, informally discussed with me his plans to publish a newsletter which would regularly feature interviews of prominent visitors to the Institute. He suggested that I take on the job of being its editor and of conducting and publishing such interviews. Though Chi Tat Chong and I had done a rather well-received interview of the well-known French mathematician Jean-Pierre Serre when he visited NUS in the 1980s, it was only a one-shot thing. Naturally, I was a bit hesitant about doing interviews of distinguished people on such a regular basis. But Louis' optimism, energy and vision persuaded me to give it a try. The first interview was published in 2003 in the first issue of the newsletter the name of which, *Imprints*, was chosen after we had considered many options.

There was some initial apprehension on my part about mathematical interviews. First, mathematicians are generally not known to be enthusiastic about being interviewed, whether it is by nature of their personality or by habit of rigor and economy in thought. Most of them would rather talk mathematics than answer trivial or general questions. Second, how does a non-expert ask meaningful and interesting questions about a deep and specialized subject or at least avoid asking plainly silly questions? Even after these years of interviewing, this feeling still remains.

Being an outsider to a field obviously has disadvantages, but that could also be an advantage. The non-expert interviewer could then be excused for asking questions that seek to elucidate and inform about the relevant field of specialization. After all, readers of a newsletter could come from a wide spectrum of disciplines. Research papers very rarely give any inkling as to how an important idea was conceived; the crucial idea is almost always presented as if it appeared out of the blue in its final form to the discoverer. If he or she could be persuaded during an interview to shed some light on the process that led to the discovery of the idea, it would have been worth the interview. Not many mathematicians or scientists

have the time or inclination to write about themselves rather than their research. Perhaps the interview could give us a glimpse of the humanity behind the seemingly emotionally detached endeavor.

While Nobel laureates are expected to be thrown into the interview circuit and make pronouncements on almost anything, Fields Medalists (mathematical counterparts of Nobel laureates) are rarely asked for their opinions on the state of the world, rarely even on the current state of mathematics. And they would not care either. The famous German playwright Johann Wolfgang von Goethe (1749–1832) was reputed to have said, “Mathematicians are like Frenchman: whatever you say to them they translate into their own language, and forthwith it is something entirely different.” Unfortunately, the converse is not true. If a mathematician says something to a journalist, the latter may not be able to translate it into a familiar language. Instead, the journalist is often left to despair of cryptic and mathematical (or even metamathematical) remarks. I was, however, more fortunate in that the distinguished visitors I interviewed were generally more than willing to suffer fools, especially in vetting the final versions of the edited transcripts for inaccuracies. But I should hasten to add that any remaining inaccuracy or shortcoming in the final versions would be my sole responsibility.

The visitors to be interviewed were suggested mostly by Louis himself though a few were suggested by program chairs. The lack of well-defined guidelines in the selection resulted in a good cross-section of productive researchers across many areas in logic, Lie groups, number theory, harmonic analysis, combinatorics, partial differential equations, dynamical systems, fluid dynamics, turbulence, probability, stochastic processes, statistics, imaging science, scientific computation, optimization, economics, epidemiology, computational molecular biology and bioinformatics. Perhaps the only guideline was that we should interview every member of the Institute’s Scientific Advisory Board.

An interview would involve three stages: preparatory reading of the visitor’s background and his or her main research work, the actual interview itself for which a set of proposed questions was sent to him or her beforehand and in which related questions arising from the responses were also asked, and finally, the preparation of an edited transcript which will then be sent for vetting and, in some cases, enhancement. Each of these stages is in itself a multidisciplinary journey of ideas speeding through chronological time and across different countries. It is an educational and exhilarating experience, sometimes dizzying but

never dull. To one who is brought up in the tradition of specialization, it is, to use the well-worn cliché, an eye-opening and mind-expanding experience.

The interviews gave me the opportunity to observe the thought processes of creative minds at close quarters and to catch a glimpse of scientific research from a personal view that is in color (even though it may not be in high definition) and in four dimensions (in space and time). One could almost feel the palpable excitement that must have been generated at the high points of scientific discovery and epiphany. Above all, one senses a kind of passion in a search for the Holy Grail, a passion that appears to be both obsessive and compulsive. To the public, the end products of scientific research are objective and devoid of emotion but it is clear that the paths that led to them are often personal and subjective and, at times, fraught with vicissitudes.

It used to be that mathematicians form a closed circle, oblivious and even disdainful of the uses of their esoteric art to practical problems. Occasionally, they would concede that some mathematical formulations of scientific issues could give rise to some interesting questions of purely mathematical interest. On the other side, the engineers and physical scientists are quite happy to cook up their own theoretical recipes and set up *ad hoc* structures to resolve immediate issues without invoking the spell of the mathematicians. But all these have changed. The success of mathematics in general relativity and quantum physics in the first half of the 20th century was followed by the statistical contributions to the Promethean efforts of the Human Genome Project that produced a rough draft in 2000 and an essentially complete version in 2003. Nowadays, the “unreasonable effectiveness of mathematics” (in the words of the physicist Eugene Wigner) is seen to be essential, if only as a necessary evil, to the resolution of specific problems in biology, physics, chemistry, engineering, medical science and economics.

When it was mooted that IMS should celebrate its 10th anniversary this year (2010), Louis suggested that the interviews that appeared in *Imprints* be reprinted as a commemoration volume for the celebration in June 2010. One would naturally ask whether it is worth publishing them other than as a memento for the occasion. No doubt, many things would have changed years after an interview. So would an interview conducted years ago be of interest or relevance to anyone now? It is a matter of course that new questions and newly emerging research areas will now take center stage and old players giving way to fresh faces. But a current scientific edifice often builds on the foundations laid by previous generations. It is more

so in mathematics that often there is still something to be mined from an old and well-worked quarry of ideas conceived many, many years ago. Thus interviews can provide an otherwise lost source of history of ideas which will not only interest the historians but which may, in a serendipitous way, illuminate some dark corner of the labyrinths of research.

As we satisfy our thirst and needs from the waters of the many streams that flow from the vast river of knowledge, we hope that this commemoration volume will make us pause and reflect on the springhead of this fast-flowing river of knowledge. In the interviews, we attempt to trace the source in the originators of the ideas and the active practitioners of the science and art, who would in turn trace the source even further back.

The interviews in this volume are essentially reprinted from the past issues of *Imprints* with some minor corrections, changes and updates. On behalf of IMS, I would like to express my deep appreciation to all the distinguished mathematicians and mathematical scientists for the honor of the interviews accorded to the Institute, especially to:

Béla Bollobás, Leonid Bunimovich, Tony Fan-Cheong Chan, Sun-Yung Alice Chang, Jennifer Tour Chayes, Carl de Boer, Persi Diaconis, David Donoho, Robert Engle, Hans Föllmer, Avner Friedman, Roe Goodman, Bryan Grenfell, Takeyuki Hida, Roger Howe, Wilfrid Kendall, Lawrence Klein, Brian Launder, Fanghua Lin, Pao Chuen Lui, Eric Maskin, Eduardo Massad, Daniel McFadden, Keith Moffatt, Stanley Osher, Doug Roble, Ron Shamir, Albert Nikolaevich Shiryaev, David O. Siegmund, Theodore Slaman, Terry Speed, Charles Stein, Gilbert Strang, Eitan Tadmor, Michael Todd, Sergio Verdú, Michael S. Waterman and W. Hugh Woodin.

And personally, I would like to thank all of them for their time, patience and help in this project. It was a great experience for me.

Yu Kiang Leong