Agenda for a Mathematical Renaissance

Most of us have wondered at some point in our careers how to motivate the interest of students in mathematics and encourage young talents to learn mathematics. In 1975 Paul Halmos [3] said: "The best way to learn is to do; the worst way to teach is to talk. The best way to teach is to make students ask, and do. Don't preach facts—stimulate acts." Halmos was a wise and respected scholar and there is general agreement that what he said is correct and important, but change is so difficult that perhaps we need more than words; we need a new agenda.

One may begin with a recent analysis developed for *The Wall Street Journal* [4] that evaluates 200 professions. According to the study *mathematician* is the top job in the U.S., placing first in terms of good environment, income, employment outlook, physical demands, and low stress. *Actuary* and *statistician*, two related professions, rank second and third, respectively. The sociological analysis provides answers to the young student's question "Why do mathematics?" Mathematicians are in demand in terms of job prospects. Also, should anyone wonder if interest in mathematics has slowed down, the study shows that the role of mathematicians, both pure and applied, in the development of our society is as important as ever.

Science and technology developed in an impressive way before, during, and immediately after World War II, which attracted post-war students to careers in research. This trend received a powerful stimulus in the 1960s and 1970s with the advent of the space age: launch of the Soviet satellite Sputnik (1957), Gagarin's first human travel into space (1961), and the first manned mission to land on the Moon (Neil A. Armstrong and Edwin E. Aldrin, Apollo 11, 1969). The impact of these advances was huge. Science was recognized for the political and economic power it could generate. In those golden years, research became as important to society as it was fascinating to practitioners.

Decades later, society's interest in many areas of research has diminished in most countries around the world. With exceptions in biomedical areas, genetics, or software engineering, the importance of mathematics and science in society is less often recognized. Mathematics and the sciences are no longer perceived as offering desirable career opportunities. Both in developed and developing countries, brilliant mathematics students who could have chosen careers in mathematics are not doing so.

It is strange that students' interest is low at a time when career opportunities for professional mathematicians are greater than ever [2]. This is true both for the applied fields where demand for mathematicians will continue to grow rapidly in the next decades and for traditional areas that are rich with new developments—see the seven Millennium Problems, cf. [1]. Yet today we notice a fundamental lack of appreciation for the richness and relevance of mathematics itself.

It is possible for mathematics and mathematicians to regain social stature. The scientific enterprise can function at full potential if there is a fast flow of knowledge between the creators and users of mathematics. This is something mathematics education can and should facilitate, especially since mathematics is currently so active and vital both in research and applications.

The culture of this millennium shows itself to be highly interactive and collaborative. It is an opportunity for mathematicians to work with scientists in other fields and also to reach out to the community at large. Mathematicians are uniquely qualified to articulate the value of mathematics in catalyzing major advances in science, health, business, economics, biomedical engineering, genetics, software engineering, and, more generally, in proving the patterns and the truths of the universe in which we live.

The trend toward interactivity is an important feature of the sciences in our time. Unfortunately, some institutions have been slow to adapt to this reality. Mathematics loses a lot when it is isolated or fragmented according to various paradigms. Universities around the world, as well as many industries and government agencies, will benefit from removing barriers to collaboration. In particular, powerful and diverse interactions between academic and industrial mathematicians should be enhanced. While the primary missions of academia and industries are different, the two cultures have much to learn from one another.

In short, while *mathematician* is a top job in the U.S. today, it is no longer possible for a mathematician to remain aloof from the passing needs of the world or to continue working in an ivory tower. As funds get scarce, the future of our profession is at stake. It is time for mathematicians to bring the vitality and usefulness of modern mathematics to the classrooms, to demonstrate its social impact, and to support this century's mathematical renaissance.

References

[1] http://www.claymath.org/millennium.

[2] P. A. Griffiths, Mathematics at the turn of the millennium, *Current Science Online* **77** (1999), 750–758.

[3] P. Halmos, The problem of learning to teach, *Amer. Math. Monthly* **82** (1975), 466–476.

[4] S. E. Needleman, Doing the math to find the good jobs. Mathematicians land top spot in new ranking of best and worst occupations in the U.S., *The Wall Street Journal*, Jan. 26, 2009, p. D2 (http://online.wsj.com/article_email/SB123119236117055127-lMyQjAxMDI5MzAxNjEwOTYyWj.html).

[5] A. N. Whitehead, *The Aims of Education and Other Essays*, MacMillan Co, 1929 (reprinted in *Education in the Age of Science*, edited by Brand Blanshard, New York, Basic Books, 1959).

—Teodora-Liliana Rădulescu
Department of Mathematics,
"Fraţii Buzeşti" National College
teodoraradulescu@yahoo.com

—Vicenţiu Rădulescu
Institute of Mathematics "Simion Stoilow"
of the Romanian Academy
vicentiu.radulescu@imar.ro
vicentiu.radulescu@math.cnrs.fr