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INTRODUCTION

By

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Distinguished Guests, Fellow Faculty Members, Old Graduates and New Students, Ladies and Gentlemen!

I have the honor to welcome you on behalf of the Division of Applied Mathematics to this celebration on the occasion of the 50th Anniversary of the Division of Applied Mathematics. I am certain that the occasion will be one that will be remembered and spoken of for years.

Fifty years is a long time in the life of an individual. Fifty years is a drop in the bucket for mathematics whose recorded history goes back at least four millennia. But what a drop it has been! To survey accurately the accomplishments of the past half century of mathematics, pure and applied, would require thousands of invited talks and could be embodied only in hundreds of thousands of papers and books, and the input and output of millions of computers.

Scanning the list of scheduled talks, it seems to me that the organizers of this conference have maximized the significant coverage of applied mathematics within the constraints of human endurance for conferences. The presenters, who are all of world class, will tell us what they and their colleagues have done and what they think the future has in store for their individual sub-disciplines. They are thus asked to be expositors of the present and anticipators of the future. Not an easy job! Mathematics, as Karl Popper pointed out, cannot predict its own future.

At the Fourth International Congress of Mathematicians held at Rome in 1908, Henri Poincaré undertook such a task. In a talk entitled "The Future of Mathematics", Poincaré mentioned ten general areas of research and some specific problems within them, which he hoped the future would resolve. What strikes me now in reading his article is not the degree to which these areas have been so developed—but the necessary omission of a multiplicity of areas which we now take for granted and which were then inconceivable.

Though the historian can always find in the past the seeds of the present, particularly in the thoughts of a mathematician as great as Poincaré, I might mention as omissions the intensification of the abstracting, generalizing and structural tendencies, the developments in logic, the intensification of the algebraic-topological, the pattern-theoretic,

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the emerging of new mathematics attendant upon the physics of fluids, materials, relativity, quantum theory, and communication theory; and, of course, the computer, in both its practical and theoretical aspects, which has altered our lives almost as much as the automobile and may ultimately surpass it in influence.

The omission of all problems relating immediately to the exterior world—with the sole exception of Hill's theory of lunar motion—will also strike readers in this audience.

The exterior world includes people. Poincaré makes no mention of mathematics and society. Why should he have done so? The members of the 4th Congress would not have expected it—and this is why, forty years later, this department was founded.

We are now in the presence of mathematical riches beyond the dreams of those who have said, in each generation including ours: it is all finished; we have but to dot the i's and cross the t's. But these riches, without contemplative judgements, would, in the words of Poincaré

> "soon become an incumbrance and their increase produce an accumulation as incomprehensible as all the unknown truths are to those who are ignorant."

Why then, more? Who will accomplish this more and what will the more accomplish? Who will pay for it? The politicians, the taxpayers, the parents who support academicians, the foundations, might all ask this question with reason. There is no historic inevitability in the continuation of a tendency that is 700 years old. Did not Western mathematics once go to sleep for a thousand years—from 300 to 1300? Or, in a different direction, one might ask with some concern: will mathematics migrate away from advanced countries to where the brains are equal and the pay is a fraction of ours?

Mathematics grows from internal pressures and from external pressures. These two sources are interrelated and gather strength each from the other. The pressures and inspirations that advance applied mathematics are largely external.

This past half century during which applied mathematics has flourished at Brown—and all over the world—was characterized historically first by WW II and then by the Cold War. Its support both financially and psychologically came in considerable measure from the demands of this conflict.

What will replace the Cold War as the angel of mathematics? Of course, defense will be with us as long as aggression is a staple of human behavior. But we begin to hear other voices. The CEO of one of the leading computer firms says over and over in his editorials that in entertainment lies the future of the United States. Panem et circensis reborn? Forget plastics and take our theorems to Spielberg?

Applied mathematics supplies descriptions, predictions and prescriptions. We are now in a sellers' market for all three. In the current advanced state of the mathematization of society and human affairs, we prescribe the systems we want to put in; from the supermarket to the library to the income tax to stocks and bonds. All products, all human activities are now wide open to mathematization. The potentialities envisaged and grasped by the Corporate World will lead it to pick up some of the tab.

Medicine and its thousand ramifications are strong contenders to be our support. We will knock at its doors loudly.

Law is just beginning to feel the impact of mathematizations. Leibniz and Christian Wolff talked about this three centuries ago.

Graphic art may be revolutionized along mathematical lines, a tendency—would you believe it?—that was present 3000 years ago in the art of Egypt.

Mathematics is now at a watershed; its stream can flow in many directions. Yes, by all means, let us put in more and more mathematizations, but as we do, let us also try to anticipate the human effects of the changes installed—a very difficult job.

But I have said enough! The past, the present, and the future of applied mathematics is what this commemorative conference is about. Let the authorities now speak.