PROGRAM
SPECIAL SESSION
MATHEMATICS COLLOQUIUM

Friday, March 8
Ninoslav Bralic Auditorium
3:00 PM Mark Spivakovsky
4:00 PM Heisuke Hironaka

- **15:00**
  "Introduction To The Problem of Resolution of Singularities in Algebraic Geometry"
  Mark Spivakovsky (Institut de Mathématiques de Toulouse, Université Paul Sabatier)

The subject of this talk is the problem of resolution of singularities in algebraic geometry, but it is intended for a general mathematical audience. The problem of resolution of singularities asks whether, given an algebraic variety X over a field k, there exists a non-singular algebraic variety X' and a proper map X' -> X which is one-to-one over the non-singular locus of X. If we cover X' by affine charts, the problem becomes one of parametrizing pieces of X by small pieces of the Euclidean space k^n.

All the basic notions such as algebraic variety, singularity, birational map, etc., will be defiend from scratch. We will describe an algorithm for resolving the singularities of plane curves. We will explain how to generalize this algorithm to higher dimensions, thereby giving a brief sketch of the proof of Hironaka's celebrated theorem on resolution of singularities of varieties over fields of characteristic zero.

Time permitting, we will briefly discuss the difficulties that arise in trying to generalize Hironaka's result to fields of positive characteristic.

- **16:00**
  "Embedded Resolution of Singularities in Algebraic Geometry"
  Heisuke Hironaka (Japan Association for Mathematical Sciences / Harvard University)

Algebraic geometry underwent phenomenal transform from *geometric* to *algebraic* in the manner of concepts and proof techniques. Resolution of singularity is typical example among many other classical and/or new problems.

Personally, I had been strongly influenced and much indebted by foundational contributions of my teachers: Oscar Zariski, Masayoshi Nagata, Alexander
Grothendieck and many others.

Here I want to present my own additions and implementations strictly focusing my attention on problems about embedded resolution of singularities. Technically new concepts and techniques in my own contributions will be explained by the following technical terms:

1) "Idealistic exponent" and its application to "MOIE"

2) Singularity set "S" and algebraic translation "P"

3) "Q" smoothing of arithmetic singularity

4) "Escalator-elevator" imagery transformation of "Q" smooth