# A scientific Day in Honor of Prof. Michele Sce

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# Algebraic-geometric Contributions

# Canonical Forms

- Paper: "Osservazioni sulle forme quasi-canonica e pseudo-canonica delle matrici"
- Study of canonical forms under unitary transformations
- Triangular form with eigenvalues along the main diagonal
- Simultaneous triangulation under weak permutability hypotheses

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# Permutability conditions

- Paper: "Su alcune proprietà delle matrici permutabili e diagonalizzabili"
- Given matrices $A$, $B$ and $C$, $AC = CB$ implies $A^r C = CB^r$, $\forall r \in \mathbb{N}$
- Converse holds if $A$ is diagonalizable, $C$ invertible complex matrices and the spectrum of $A$ does not involve roots of unity
- Conditions assuring that $A$, $B$ normal implies $AB$ normal

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# Generalized Riemann matrices

- Paper:"Su una generalizzazione delle matrici di Riemann I e II"
- Given a complex matrix $C$, denote $\overline{C}$ its conjugate and $C'$ its transpose
- A matrix $W$ is a generalized Riemann (or Weyl) matrix if $\Gamma = WC$, where $\Gamma$ is hermitian positive definite and $\overline{C}' = \varepsilon C$, $\varepsilon = \pm 1$
- $W$ is completely reducible, namely conjugate to diagonal block matrix $\mathrm{diag}(W_1, \ldots, W_r)$, with $W_i$ Weyl matrices not further reducible

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- Paper:"Geometria combinatoria e geometrie finite"
- A survey reporting 47 results and 31 Conjectures open in 1981
- Given a space $S$ a Sylvester-Gallai configuration is a subset of points $X$ of $S$ such that $|L \cap X| \neq 2$ for any line $L$
- every Sylvester-Gallai configuration in the real plane is contained in a line

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- Flexes of a non-singular cubic in the complex plane form a Sylvester-Gallai configuration
- In 1966 Serre asked whether a non-planar Sylvestser-Gallai configuration exists in the complex 3-dimensional space
- In 1986 Kelly shows none exists exploiting deep facts from Algebraic Geometry
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