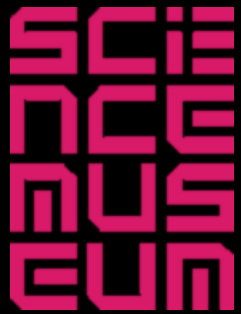# Using Old Computers
for Teaching Computer Science
(at the Museum of Computing Tools of the University of Pisa)

G.A. Cignoni & F. Gadducci

Making the History of Computing Relevant
Science Museum, London
17-18 June, 2013

The HMR project

- Hacking the Macchina Ridotta

- History of the Italian early computers

- The Macchina Ridotta, built in Pisa in 1957

- The Calcolatrice Elettronica Pisana, built in 1961

- The Olivetti computers from 1959 to 1965

- From a deep technological point of view

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Experimental archeology

- Lots of documents and blueprints from the archives, however, many are missing

- To understand the technology (to rebuild it) we must proceeds by hypotheses

- Hypotheses are formulated on the basis of
  - Recovered information
  - Technological knowledge of the times
  - Memories of the designers still with us

- Hypotheses are verified experimentally by using edge software simulation technology

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Results of the technological approach

- The rediscovering of the Macchina Ridotta

- A lost machine, dismantled in 1959 and forgotten

- A relevant computer
  - The very first built in Italy
  - Used for computing services and for training
  - Completely different from the second one built in 1961
  - Designed in 1956 and built in 1957 after major revisions
  - Small, but elegant, fast and state of the art (in 1957)

- A whole new chapter in the history
  of Italian computer science

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Relics from a technological point of view

- Years of rescues, acquisitions and donations

- Some relevant pieces
  - 1961 2nd CEP, built at the University of Pisa
  - 1966 Olivetti 9104, built for CNR-INAC in Rome
  - Many big computers, from Bulls to Crays
  - Remarkable collection of mechanical calculators
  - Milestones of personal computing, from P101 to notebooks

- Presented by exploring their technical details

- Old machines as a way to introduce computer science concepts and mechanisms
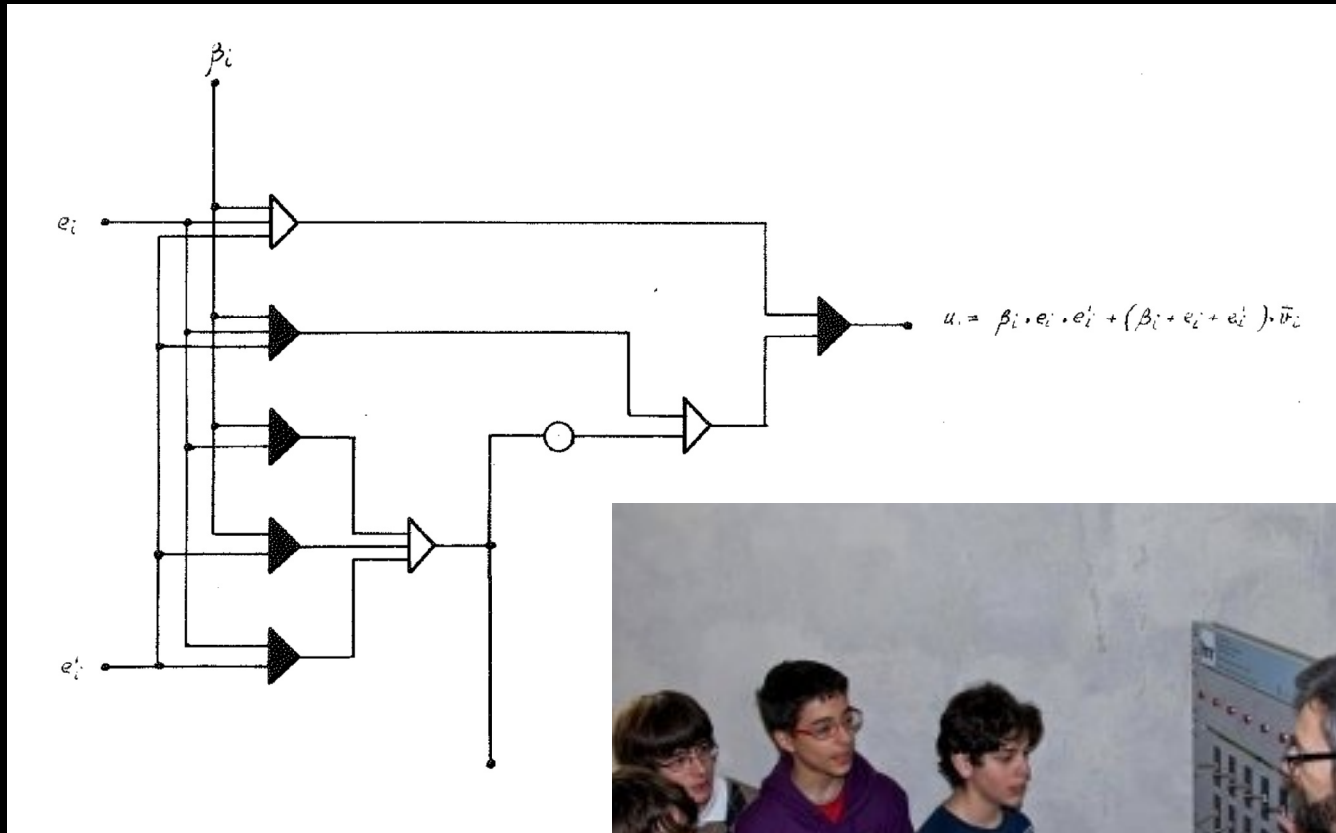
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From arithmometers...

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… to the MR rebuilt binary adder

$$u_i = \beta_i \cdot e_i \cdot e_i' + (\beta_i + e_i + e_i') \cdot \bar{u}_c$$

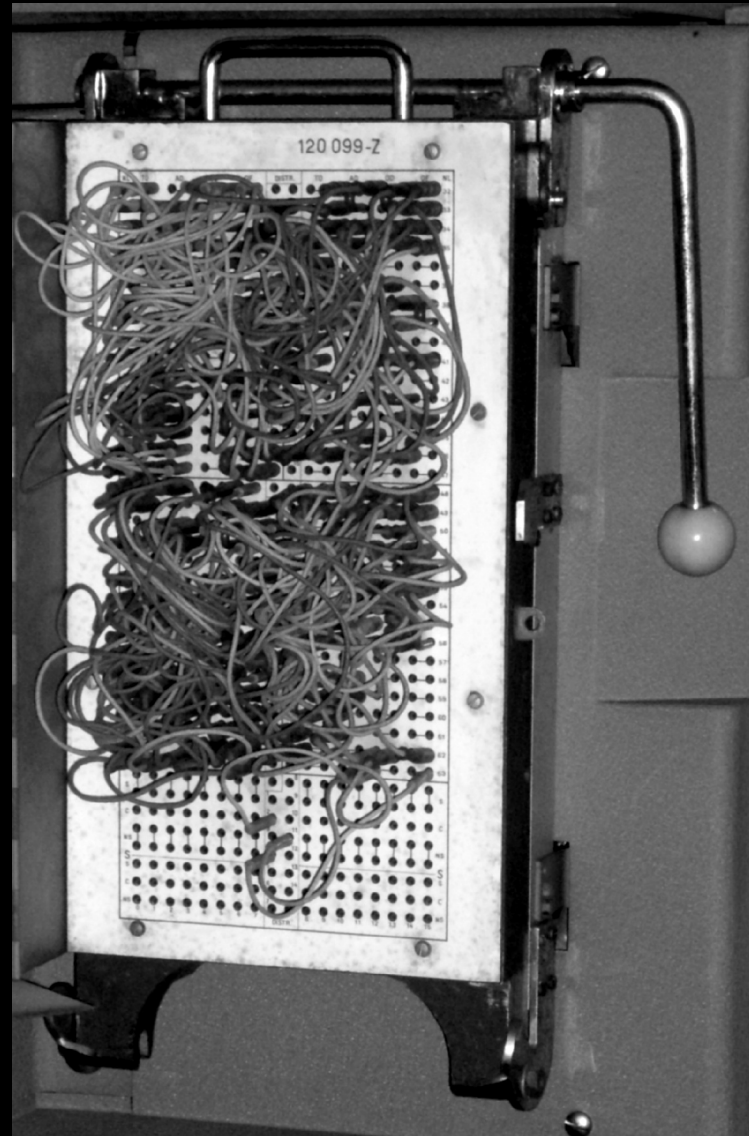G.A. Cignoni & F. Gadducci

The Bull Gamma 3...

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... and its hardware programs
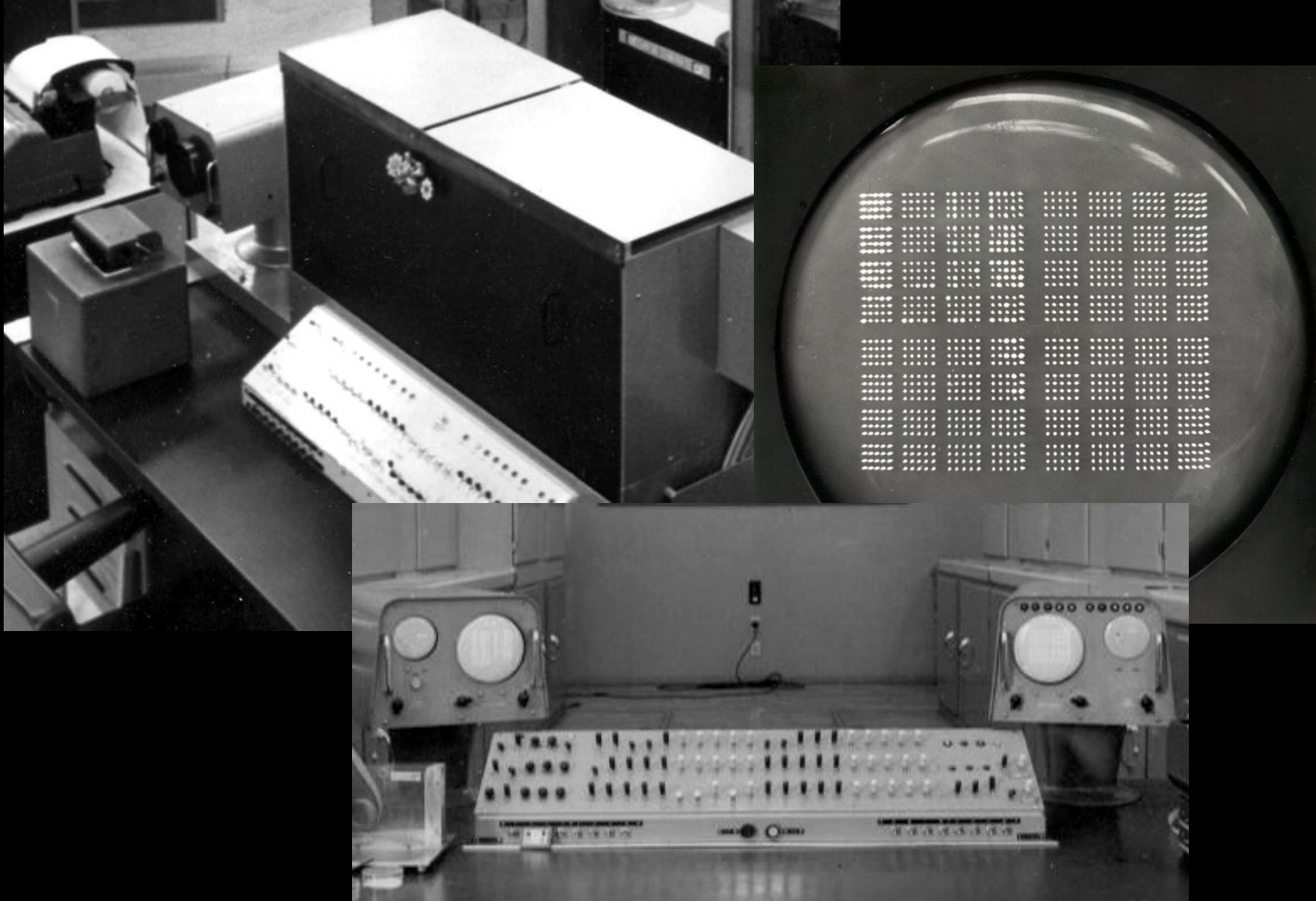
The Olivetti 9104 CINAC...

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... and the memories of the Ferranti Mk1*
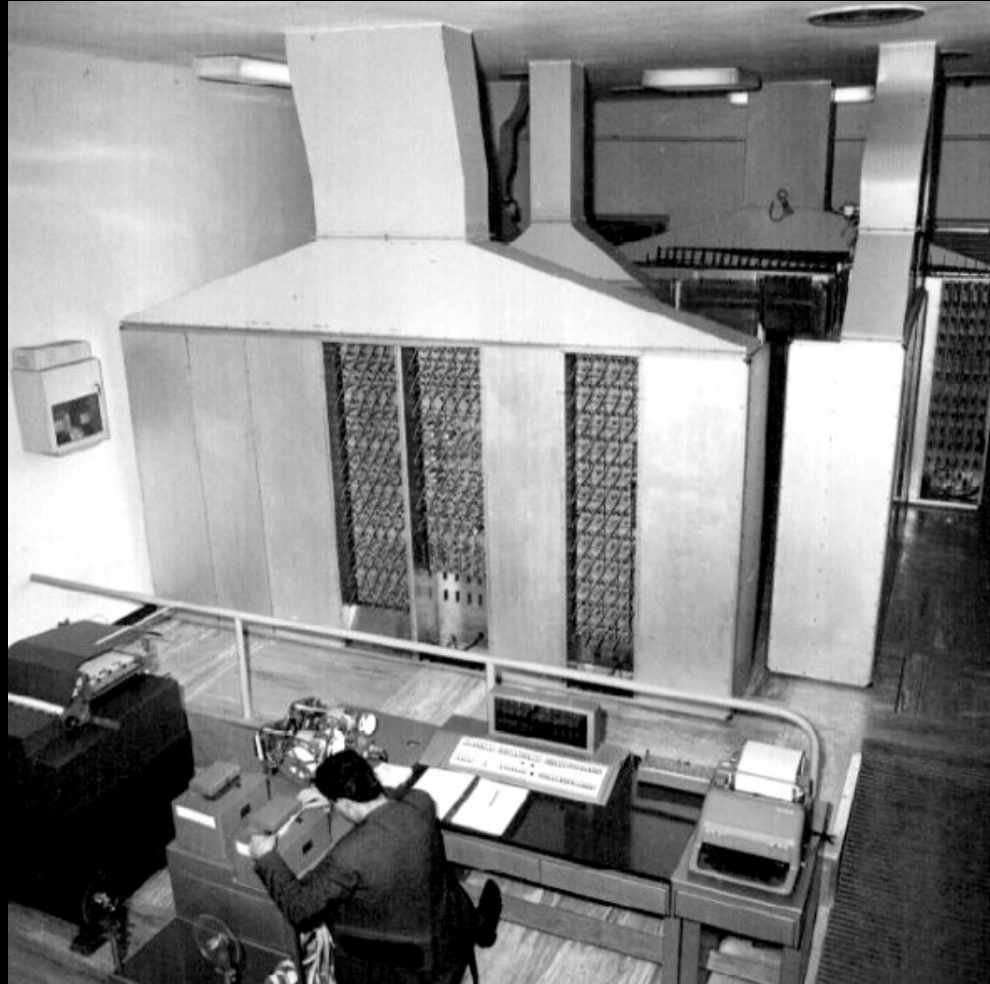

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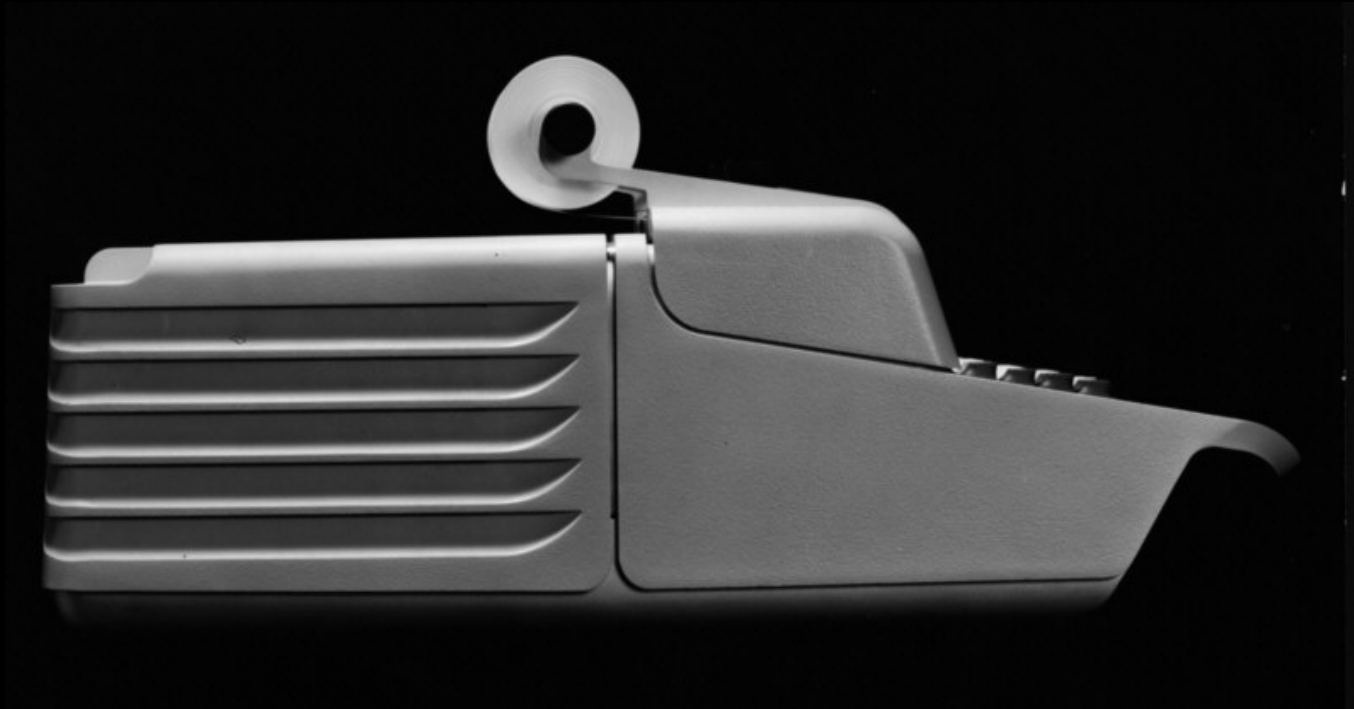
The damned transistors...

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… and the bad luck of the 2ⁿᵈ CEP

Personal computing, from early times...

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... to intriguing machines (and testimonials)

July 24, 1985, Lincoln Center, New York
Andy Warhol, Debbie Harry

Demonstrable simulators

- Simulators were used during the historical research to validate the MR rebuilding hypotheses

- Improved with a bit of eye-candy, simulators can be used to illustrate computer science

- From several points of view
  - Mechanisms of computer technology
  - Basics of computing theory
  - Pop culture about computers

- Historical value as well as oddity of old machines are exploited to raise interest through curiosity

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The lost Machine of Pisa

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Mechanisms: how to launch an application

- Today a click on an icon, but, inside the computer, still a jump to the first instruction of the program

- The jump has to be set manually, in binary

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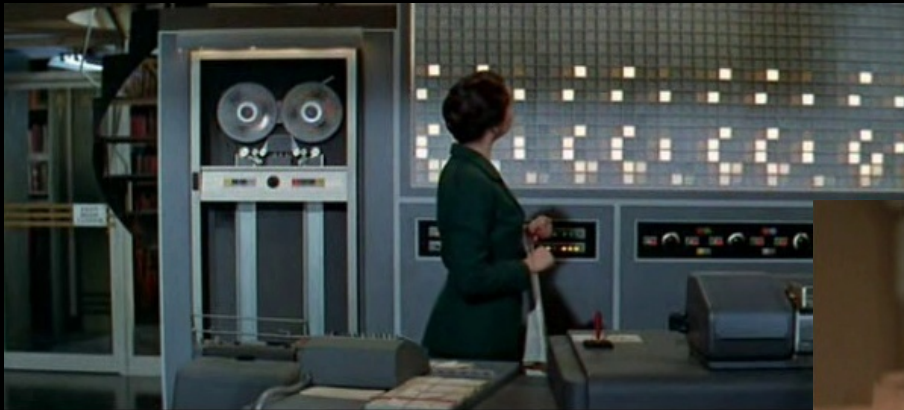
Basics: a game from the future

- A classical 3 reels - 8 symbols slot machine, a game using an algorithm not yet invented in 1957-58

- But the MR is an universal machine, so...

Pop culture: lot of blinking lights

- Lights switch on/off, not too fast, often in patterns: computers must look complicated yet meaningful

- **Examples from Desk Set (1957) and Alien (1979)**

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