PHILBRICK INSTALLATION
At
UNIVERSITY of BOLOGNA
(1951)

After the War ended, the large amounts of material left by both Allied and Axis troops required cataloging and recovery.
Thus, in 1946, the A.R.A.R. (*Azienda Rilievo Alienazione Residuati*) was founded and entrusted with this task. In a 1947–1948 report (exact date unknown) appears what is probably the earliest reference to electronic analog computers in Italian literature: a direct mention of ARAR acquiring, through surplus channels, two “calcolatrici elettroniche superautomatiche,” one for the University of Bologna and the other for the Politecnico di Torino.

The Philbrick installation was acquired through European Recovery Funds after a request by Giuseppe Evangelisti and Aristide Prosciutto on 15th December 1950. The machine was delivered to the Sala Calcoli (Computing Room) inside the Engineering Faculty’s Library, on 14th April 1951 after traveling for a month on the steamer *Algequin Victory*. An official inauguration was undertaken on the same day.[1]

By later that year, Dino Zanobetti had a 55-page booklet published detailing the installation. This publication was referenced in *The Lightning Empiricist* Issue 1 (1952). The booklet contains, in this order:

- **Generalities on Electronic Analog Computers**
  - It details the usage of electronic computers as *differential analyzers* vs *analog computers*. This was underlined as at the time, the Italian term “*calcolatrice elettronica”* (electronic calculator or electronic computing machine more broadly) could refer to both digital and analog types. Furthermore, he clarifies the usage of electronic calculator as differential analyzers (machines capable of solving differential equations with possibly no correlation to a physical model) versus analog computers (a simulator that instantiates an indirect analogy between two physical systems using electronic components and feedback-type amplifiers)
- **The Bologna Installation**
  - The Philbrick installation is described in this section, with time constants and arrangements of the modules, various timing generators and K3 and K4 operators function explained, oscillographs images of transfer functions also shown.
  - Details the necessary power conversion equipment to allow the machine, which expected 115V at 60Hz, to accept the 110 to 240V 50Hz Italian line voltage, which had very poor regulation (it wasn’t uncommon, until the mid ‘60s, for TVs to need a ferroresonant regulator transformer to compensate for the evening voltage dip of as much as 20%).
    This power pack was composed of two stages:
    - First stage was an AC asynchronous motor mechanically coupled to a DC generator.
    - The second stage was in turn a DC motor coupled to a single phase AC alternator, which then fed a Soresen-brand regulator (Philbrick itself suggested the *2000S* model, unclear if the same used in this installation)
  - A photograph of the installation is also present, showing how the Central Unit (RS + CC-2 + Regulator) was housed in the standard Philbrick rolling cart. The K3 and K4’s weren’t housed in the HC-type rack, but simply arranged on a table and power was connected via cascading cables. The photograph also shows how shelves behind the table were used to store unused components.
- **Appendix A**: **Hardware list**
  - Hardware type and quantities are described in this section.
    - (1) Voltage and frequency converter as described above, plus a voltage regulator

1 https://magazine.unibo.it/it/articoli/evangelisti

- (2) Model RS Regulated ± 300V DC power supply
- (1) Model CC-2 Central Component ('Apparato Centrale', as per Zanobetti's translation)
- (10) K3-A Adding Component
- (16) K3-C Coefficient Component
- (7) K3-J Integrating Component
- (4) K3-D Differentiating Component
- (2) K4-MU Multiplying Component
- (3) K3-K Augmenting Integrator Component
- (3) K3-E Augmenting Differentiator Component
- (1) K3-S Squaring Component
- (2) K3-T Rooting Component
- (4) K3-H Hysteresis Component
- (3) K3-Z Inert-Zone Component
- (1) K3-V Absolute Value Component
- (2) K4-FF Functional Component
- (1) K4-FG Function Generator
- (2) K4-DD Dynamic Component
- (1) K4-CO Controller Component
- (1) K3-σ and K3-τ Component
- (2) Oscilloscope for voltage measurements
- (1) Camera attachment for recording purposes
- (1) "SR" component (*Componente Servorelè*, details to follow)

- **Appendix B: Typical Problems to be applied to the Analog Computer**
- **Bibliography:**
  - This short 23-entry bibliography was said to be "collecting pretty much all the main publications" about electronic analog computers. It includes the Ragazzini op-amp paper, Bush's own work about the differential analyzer, two of Philbrick's works, some of Korn's publications. All the works are, of course, dated up to 1951.

A later (1952) work by the same author talks about how the "high speed analog computer" could be used for circuit simulation [2]. Zanobetti, like in his earlier 1951 work, explicitly describes the high-speed analog computer as any repetitive computer capable of displaying a flicker-free oscillograph picture.

In 1956 yet another mention to the Bologna installation is made, by an article published in the journal *Ingegneria Meccanica*, Issue n° 12, titled "*Influenza del Progresso Elettronico nella Soluzione di Problemi Vibratori, Particolarmente sentiti nelle Costruzioni Aeronautiche".* This article explicitly references how Bologna possessed a Philbrick high-speed analog computer ever since 1950, and that "many Universities now possess such a scientific instrument" at the time.

The fate of the Bologna installation remains unknown, like many of the other Philbrick computers of the era.

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2 D. Zanobetti - "*Impiego della calcolatrice analogica elettronica ad alta velocità come analizzatore di circuiti elettrici in regime vario",* 1952, Bologna.