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Aurorae borealis and cosmic rays: from Vannevar Bush's Differential Analyzer to digital simulation

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Independent research, like studies on aurorae borealis and cosmic rays, founded their point of union in the use of Differential Analyzer, an analog computer invented by Vannevar Bush () in 1931, for measurements. In fact, the computers answered a growing demand for computing fundamental to prove new cosmological hypotheses whit scientific measurements. The Analyzer was used by Manuel Vallarta (1899-1977) and Georges LeMaître (1894-1966) to numerically solve the complex system of differential equations describing the trajectories of cosmic rays. Bush promoted the engineering of the analyzer and obtained funding from the Rockefeller Foundation for a redesign of the instrument and its electrification. The approximated calculations provided a new image of the cosmos and demonstrated the power of the computer. After the World War Two, the analogic machine revealed their limit with respect to new digital technologies. Now scientific research required different performances that the new electronic and digital computers could offer, as the MANIAC I, built under the direction of Nicholas Metropolis.
The new frontier of computation offered the new perspective of simulation.

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