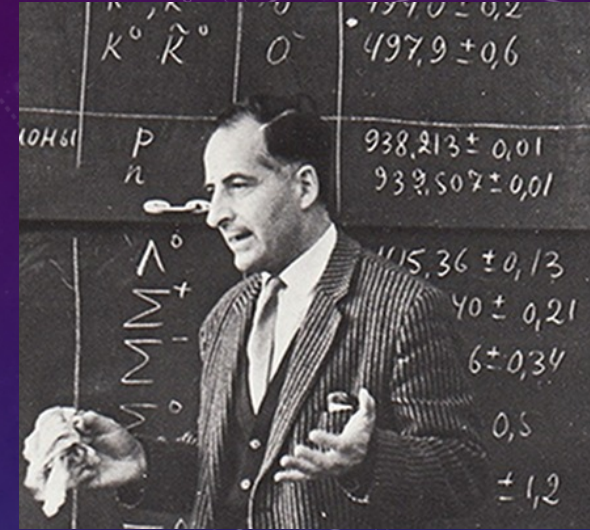


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FROM “VIRTUAL TRANSITIONS” TO NEUTRAL PARTICLE OSCILLATIONS



- **Mid '50s.** Hypothesis of “virtual transitions” (induced by the weak interaction) turning K^0 -mesons into their antipartners:
 $\bar{K}^0 \rightleftharpoons K^0$

Murray Gell-Mann, Abraham Pais, *Behaviour of Neutral Particles under Charge Conjugation*, *Physical Review*, 97(5), 1955

- **1957.** Idea extended from the realm of kaons to the realm of neutrinos, first suggestion of neutrino-antineutrino oscillations: $\bar{\nu} \rightleftharpoons \nu$

Bruno Pontecorvo, *Inverse Beta Processes and Nonconservation of Lepton Charge*, *JETP*, 34, 247-249, 1958

- **1962, Nagoya School.** Idea that “virtual transmutations” occur between neutrinos of different flavours: $\nu_e \rightleftharpoons \nu_\mu$

Ziro Maki, Masami Nakagawa, Shoichi Sakata, *Remarks on the Unified Model of Elementary Particles*, *Progress of Theoretical Physics*, 28(5), 1962