



RITA LEVI-MONTALCINI (1909-2012): THE GREAT TEACHER IN HEURISTICS

Il corpo faccia quello che vuole. Io non sono il corpo: io sono la mente.

(The body does what it wants. I am not a body: I am a soul.)

RLM

Professor Rita Levi-Montalcini, the 1986 Nobel Prize winner in Physiology or Medicine for the discovery of nerve growth factor (NGF), died Sunday, 30 December 2012, at her home in Rome, Italy. She was 103 years old.

Levi-Montalcini's NGF provided a conceptual framework for the formulation of the neurotrophic hypothesis: particular neuronal types require trophic ("nutritional") factor(s) for neurite growth and neurotransmitter production for proper function and survival. Her data on the prototype neurotrophic factor NGF triggered an unprecedented search for a family of related proteins now commonly called neurotrophins. Moreover, a large number of recent studies revealed non-neuronal effects of this talented molecule, hence *The NGF is wider than the neuron* – paraphrasing Emily Dickinson's *The brain is wider than the sky*. More importantly, Levi-Montalcini's NGF determined a new law of biology: cells require specific protein signals for differentiation and survival, that is, the general theory of cell growth factors. All this resulted in the discovery of hundreds of growth factors that affect almost all facets of cell biology. In analogy with Mendelevium (Md), Einsteinium (Es) and Fermium (Fm) in Dimitri Mendeleev's Periodic Table of chemical elements, we may now introduce NGF as Montalcinium (Mt) in the Periodic Table of biomolecules.

Her amazing journey in Eureka-land started from her "private laboratory" in Turin she named *Robinson Crusoe*, later on through Viktor Hamburger's Department of Zoology of Washington University in St Louis, MO and in Herta Mayer's Tissue Culture Laboratory in Rio de Janeiro to Rome, Italy where in 1962, Levi-Montalcini became Director of the Institute of Cell Biology, splitting her time between St Louis and Rome until 1977. Rita Levi-Montalcini's

unpredictable laboratory protocols included (i) the transplantation of mouse sarcoma 180 into chicken embryo leading to the growth of sympathetic and sensory nerves, (ii) snake venom used to destroy DNA in sarcoma homogenate leading to higher nerve growth than that induced by sarcoma itself, and (iii) the homogenate of male mouse submandibular glands (the mammalian homologue of snake venom) leading to even higher nerve growth than snake venom. This heuristic saga of NGF was marked by a rare combination of scientific reasoning, intuition, and chance, the latter “favors only the mind that is prepared”, quoting Louis Pasteur.

“She was a force of nature” (Dr Louis “Pepper” Dehner, a pathologist at Washington University’s School of Medicine).

“In her independence and determination, she was a model for all scientists” (Dr Tom Woolsey, the George H. and Ethel R. Bishop Scholar in Neuroscience at the School of Medicine, The Pontifical Academy of Sciences of the Vatican).

“She was one of the chief protagonists of the most glorious episode in the modern history of neuroscience” (AD Smith, a neuroscientist at University Department of Pharmacology, South Parks Road, Oxford, UK).

Her centennial life created the scientific bridge between two millenia, a path followed by many generations. This is the guarantee of her “presence in absence”.*

Editors, *Biomedical Reviews*

* From “The Book of Ease” (also known as “The Book of Changes”) based on Yin-Yang Chinese philosophy.