



भौतिक अनुसंधान प्रयोगशाला, अहमदाबाद Physical Research Laboratory, Ahmedabad

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41_PRL Ka Amrut Vyakhyaan

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**“Next Generation Species Specific
and Eco Friendly Antibiotics
and thoughts about the origin of
life”**

Prof. Ada Yonath

Nobel Laureate

**Director, Helen and Milton A. Kimmelman Center for
Biomolecular Structure and Assembly of
the Weizmann Institute of Science, Israel.**



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Title: “Next Generation Species Specific and Eco Friendly Antibiotics and thoughts about the origin of life”

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Abstract

Resistance to antibiotics is a severe problem in contemporary medicine. Many antibiotics inhibit protein biosynthesis by hampering the ribosome function. Structures of bacterial ribosomes in complex with these antibiotics illuminated common pathways of antibiotics inhibitory action. Structures of multi-resistant pathogenic bacterium revealed their novel structural motifs and led to the design of antibiotics with desired properties that can be optimized in terms of their chemical properties, toxicity and penetration, alongside species-specificity, thus preserving the microbiome. They can also be optimized for bio degradability, thus reducing the ecological hazards caused by the spread of the current antibiotics' non-degradable metabolites.

The site for peptide bond formation is located within an almost fully conserved internal region made exclusively of RNA. The high conservation of this region implies its existence irrespective of environmental conditions and indicates that it may represent an ancient RNA machine, which could be the kernel around which life originated. A lab constructs according to this pocket were shown to possess catalytic capabilities in peptide bond formations. Thus indicating that a molecular prebiotic bonding entity is still functioning in all living cells of all organisms.

The Speaker

Prof. Ada E Yonath is an Israeli crystallographer best known for her pioneering work on the structure of ribosomes. She is the current Director of the Helen and Milton A. Kimmelman Center for Biomolecular Structure and Assembly of the Weizmann Institute of Science. Prof. Yonath graduated from the Hebrew University of Jerusalem with a bachelor's degree in chemistry in 1962, and a master's degree in biochemistry in 1964. In 1968, she obtained her Ph.D. from the Weizmann Institute of Science for X-ray crystallographic studies on the structure of collagen, with Wolfie Traub as her Ph.D. advisor. Prof. Yonath accepted postdoctoral positions at Carnegie Mellon University (1969) and MIT (1970). While a postdoc at MIT she spent some time in the lab of subsequent 1976 chemistry Nobel Prize winner William N. Lipscomb, Jr. of Harvard University where she was inspired to pursue research on large and complex molecules.

In 1970, she established what was for nearly a decade the only protein crystallography laboratory in Israel. Then, from 1979 to 1984 she was a group leader with Heinz-Günter Wittmann at the Max Planck Institute for Molecular Genetics in Berlin. She was Visiting Professor at the University of Chicago in 1977–78. She headed a Max-Planck Institute Research Unit at DESY in Hamburg, Germany (1986–2004) in parallel to her research activities at the Weizmann Institute.

In 2009, she was awarded the Nobel Prize in Chemistry (co-recipient with Thomas Steitz and Venkatraman Ramakrishnan). She was the first Israeli woman to be awarded a Nobel Prize. The first woman from the Middle East to win the Nobel prize in the sciences, and the first woman in 45 years to win the Nobel Prize for Chemistry.

In 2011, she was awarded the Marie Curie Medal by the Polish Chemical Society and in 2020, she was elected a Foreign Member of the Royal Society.



About PRL

The Physical Research Laboratory (PRL), known as the “cradle of space science” in India, is one



of the premier research institutes founded in 1947 by Prof. Vikram Sarabhai, a renowned Cosmic Ray Scientist, a great visionary and institution builder. PRL played a seminal role in producing a highly motivated cadre of space scientists and the technologists of highest international repute. The first scientific rocket launched from Thumba on 21st November-1963 and many other rockets launched thereafter contained payloads developed at PRL. Dr. Sarabhai initiated many of these scientific and technical activities at PRL which eventually led to the formation of the Indian Space Research Organization (ISRO). Therefore, PRL is known as the “cradle of space science” in India. Further, the research in the area

of Plasma Physics expanded to the formation of the Institute of Plasma Research (IPR).

As an institution PRL is unique in that it conducts fundamental research in a wide range of research areas from the Earth to the cosmos, and comprising Astronomy and Astrophysics; Solar Physics; Space and Atmospheric Sciences; Theoretical Physics; Geosciences; Atomic, Molecular and Optical Physics, Astrochemistry; and Planetary Sciences and Space Exploration. PRL is one of the rare research institutes of international repute wherein research in such diverse fields of sciences is carried out using several state-of-the-art experimental facilities that exist under one umbrella.

Along with the ongoing research, several new initiatives have been taken up during the last few years. The Multi-Application Solar Telescope (MAST) at Udaipur Solar Observatory has been operationalized. PRL initiated scientific programmes in frontier areas of research, which include a search for exo-planets, laboratory studies of interstellar grains, laboratory synthesis of cold astro-molecules and experimental studies in the field of quantum optics. PRL is also developing several scientific payloads as a part of ISRO’s larger vision and contributing to roadmap for competitive scientific exploration of the solar system and beyond. In particular, PRL has been contributing significantly not only in building instruments for space missions, such as Chandrayaan-1, Chandrayaan-2, AstroSat and upcoming Aditya-L1, Chandrayaan-3 and planetary and space missions, but also by bringing out new and insightful science results.

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