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Nobel Prizes 2011

Chemistry

To the surprise of many, the Royal Swedish Academy of Sciences awarded the Nobel Prize in Chemistry to Dan Shechtman (Technion Haifa, Israel) for the discovery of quasicrystals.[1] In quasicrystals, atom positions are ordered, but show five-, eight-, ten-, or twelvefold rotational symmetry not found in standard crystals, and was long thought to be impossible. In particular, Linus Pauling's life-long opposition to Shechtman's interpretation was notorious. Tilings of pentagons discovered by mathematician Roger Penrose are key to the understanding of these infinite aperiodic structures. Such motifs were also used by Arab artists as early as the 13th century. The Swedish Academy praises Shechtman for "not only the discovery of quasicrystals, but the realization of the importance of this result and the determination to communicate it to a skeptical scientific community."

Quasicrystalline structures were found to occur in intermetallics by Shechtman, and also in dendrimer liquid crystals, star copolymers, self-assemblies of nanoparticles, as well as naturally in a mineral found in Russia by other researchers. Intermetallic quasicrystals are often brittle and their transport properties resemble glasses rather than crystalline materials. Their surface energy is low, and they are quite resistant to corrosion and adhesion.

Shechtman was born in Tel Aviv in 1941. He studied materials engineering at Technion and received a PhD in 1972 in metallurgy. He then did postdoctoral research with the US Air Force at Wright Patterson AFB in Ohio and returned to Technion in 1975. He made his pioneering discovery of a metastable Al–Mn alloy with icosahedral symmetry by means of electron diffraction during a sabbatical at the US National Bureau of Standards (now NIST, in Gaithersburg, MD) in 1982, but it took him until 1984 to get the results published in *Physical Review Letters*. Ten years later, a further sabbatical took him to the US National Institute of Standards and Technology again. He is the recipient of numerous prestigious awards, such as the European Materials Research Society Award (2008) and the Wolf Prize in Physics (1999). Photo: Technion.

Physics

The Nobel Prize in Physics was awarded to Saul Perlmutter (b. 1959; Lawrence Berkeley National Laboratory, USA), Brian P. Schmidt (b. 1967; Australian National University, Weston Creek, Aust.), and Adam G. Riess (b. 1969; Johns Hopkins University, Baltimore, USA) for their discovery in 1998 that the universe not only expands, but this expansion is accelerating. They reached this conclusion from observations of distant supernovae, that is, explosions of old compact stars near the end of their life cycle that emit huge amounts of light. The expansion is ascribed to dark energy, whose properties remain unknown.[2]

Physiology/Medicine

The Nobel Assembly at Karolinska Institutet awarded the Nobel Prize in Physiology or Medicine to Bruce A. Beutler (b. 1957; The Scripps Research Institute, La Jolla, CA, USA), Jules A. Hoffmann (b. 1941; University of Strasbourg, France) for their research on innate immunity, and Ralph M. Steinman (b. 1943; Rockefeller University, New York, USA) for his discovery of dendritic cells and their role in adaptive immunity.[3] The Assembly and the general public learned a few hours after the announcement that Steinman had tragically passed away only days before the announcement. The Assembly stood by its decision although Nobel Prizes cannot normally, that is deliberately, be given posthumously.

Hoffmann and Steinman have served on the editorial boards of the journals *Immunology* and *European Journal of Immunology*, respectively.

Awarded ...

D. Shechtman

[1] *Quasicrystals: Structure and Physical Properties* (Ed.: H.-R. Trebin), Wiley-VCH, Weinheim, **2003**.
[2] M. Livio, *The Expanding Universe*, Wiley, New York, **2000**.
[3] *Handbook of Dendritic Cells: Biology, Diseases and Therapies*, (Eds: M. B. Lutz, N. Romani, A. Steinkasserer), Wiley-VCH, Weinheim, **2006**. With an introduction by R. M. Steinman.

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