



## Michael Sela



**Date of Birth** 6 March 1924

**Place** Tomaszow (Poland)

**Nomination** 2 December 1975

**Field** Biology

**Title** Professor

**Professional address**

The Weizmann Institute of Science

Department of Immunology

P.O. Box 26

Rehovot 76100 (Israel)

### Most important awards, prizes and academies

*Prizes:* Israel Prize in Natural Sciences (1959); Rothschild Prize in Chemistry (1968); Otto Warburg Medal, German Society of Biological Chemistry (1968); Emil von Behring Prize of the Phillips University (1973); Gairdner Foundation International Award, Toronto (1980); Prize of the Institut de la Vie, Fondation Electricité de France (1984); Albert Einstein Golden Medal, UNESCO (1995); Harnack Medal of the Max-Planck Society (1996); Interbrew-Latour Health Prize, Belgium (1997); Wolf Prize in Medicine (1998). *Honorary Doctorates:* Université de Bordeaux II (1985); National Autonomous University of Mexico (1985); Tufts University, Medford, MA (1989), Colby College, Maine (1989); Université Louis Pasteur, Strasbourg (1990); Hebrew University, Jerusalem (1995); Tel Aviv University (1999); Ben-Gurion University of the Negev (2001). *Academies:* Israel Academy of Sciences and Humanities; American Academy of Arts and Sciences; Pontifical Academy of Sciences; US National Academy of Sciences; Deutsche Akademie der Naturforscher Leopoldina; Russian Academy of Sciences; French Académie des sciences; Italian Academy of Sciences; American Philosophical Society; Romanian Academy; Polish Academy of Arts and Sciences. *Honours:* Commander's Cross of the Order of Merit of the Federal Republic of Germany (1986); Officer de l'Ordre de la Légion d'honneur, France (1987); Caballero, Order de San Carlos, Colombia.

### Summary of scientific research

1) The development of synthetic antigens. 2) Their use to elucidate the molecular basis of antigenicity (role of steric conformation, electric charge, shape, size, composition, optical configuration of component building stones, etc.). 3) The establishment, making use of synthetic antigens, of the genetic control of immune response. 4) The development of the notion of synthetic vaccines, including the first synthesis of antigens capable of provoking antibodies that neutralize a virus (MS2 bacteriophage) and bacterial toxins (diphtheria and cholera). 5) The combined use of synthetic antigens and synthetic adjuvants, covalently linked to a synthetic polymer carrier, leading to antigens capable of provoking in aqueous solution protection against a virus and a bacterial toxin. 6) The development of a synthetic amino acid copolymer which serves as a specific drug against multiple sclerosis. 7) Monoclonal antibodies against the ErbB2 receptor, present in high density in breast cancer, either inhibited or enhanced tumor growth. The inhibitory antibodies induced differentiation of human breast cancer into normal milk-producing breast cells. 8) Synthesis of peptide antagonists to the most myasthenogenic T cell epitopes derived from the acetylcholine receptor, in an effort to find drugs against myasthenia gravis.

### Main publications

Synthesis, characterization and immunogenicity of some multichain and linear polypeptides containing tyrosine (with Fuchs, S. and Arnon, R.), *Biochem. J.*, 85, p. 223 (1962); Antibodies to sequential and conformational determinants (with Schechter, B., Schechter, I. and Borek, F.), *Cold Spring Harbor Symposia on Quantitative Biology*, 32, p. 537 (1967); Antigenicity: some molecular aspects, *Science*, 166, p. 1365 (1969); Demonstration of determinant-specific differences in response to synthetic polypeptide antigens in two strains of inbred mice (with McDevitt, H.O.), *J. Exp. Med.*, 122, p. 517 (1965); Antibodies Reactive with Native Lysozyme Elicited by

a Completely Synthetic Antigen (with Arnon, R., Maron, E. and Anfinsen, C.B.), *Proc. Natl. Acad. Sci. USA*, 68, p. 1450 (1971); A pilot trial of Cop 1 in exacerbating-relapsing multiple sclerosis (with Bornstein, M.B., Miller, A., Slagle, S., Weitzman, M., Crystal, H., Drexler, E., Keilson, M., Merriam, A., Wassertheil-Smoller, S., Spada, V., Weiss, W., Arnon, R., Jacobsohn, I. and Teitelbaum, D.), *The New England Journal of Medicine*, 317, p. 408 (1987); Mechanistic aspects of the opposing effects of monoclonal antibodies to the ErbB2 receptor on tumor growth (with Stancovski, I., Hurwitz, E., Leitner, D., Ullrich, A. and Yarden, Y.), *Proc. Natl. Acad. Sci. USA*, 88, p. 8691 (1991); Peptide analogs to pathogenic epitopes of the human acetylcholine receptor  $\alpha$ -subunit as potential modulators of *myasthenia gravis* (with Zisman, E., Katz-Levy, Y., Dayan, M., Kirshner, S.L., Paas-Rosner, M., Karni, A., Abramsky, O., Brautbar, C., Fridkin, M. and Mozes, E.), *Proc. Natl. Acad. Sci. USA*, 93, p. 4492 (1996); A synthetic random basic copolymer with promiscuous binding to class II MHC molecules inhibits T-cell proliferative responses to major and minor histocompatibility antigens in vitro and confers the capacity to prevent murine graft-versus-host disease in vivo (with Schlegel, P.G., Aharoni, R., Chen, Y., Chen, J., Teitelbaum, D., Arnon, R., Sela, M. and Chao, N.J.), *Proc. Natl. Acad. Sci. USA*, 93, p. 501 (1996); A peptide composed of tandem analogs of two myasthenogenic T cell epitopes interferes with specific autoimmune responses (with Katz-Levy, Y., Paas-Rosner, M., Kirshner, S., Dayan, M., Zisman, E., Fridkin, M., Wirguin, I., Sela, M. and Mozes, E.), *Proc. Natl. Acad. Sci. USA*, 94, p. 3200 (1997); Copolymer 1 induces T-cells of the T helper Type 2 that cross-react with myelin basic protein and suppress experimental autoimmune encephalomyelitis (with Aharoni, R., Teitelbaum, D. and Arnon, R.), *Proc. Natl. Acad. Sci. USA*, 94, p. 10821 (1997); Copolymer 1 acts against the immunodominant epitope 82-100 of myelin basic protein by T cell receptor antagonism in addition to the MHC blocking (with Aharoni, R., Teitelbaum, D. and Arnon, R.), *Proc. Natl. Acad. Sci. USA*, 96, p. 634 (1999); Immunomodulation of experimental autoimmune encephalomyelitis by oral administration of copolymer 1 (with Teitelbaum, D. and Arnon, R.), *Proc. Natl. Acad. Sci. USA*, 96, p. 3842 (1999); T-cell immunity to copolymer-1 confers neuroprotection on the damaged optic nerve: possible therapy for optic neuropathies (with Kipnis, J., Yoles, E., Porat, Z., Cohen, A., Mor, F., Cohen, I.R. and Schwartz, M.), *Proc. Natl. Acad. Sci. USA*, 97, p. 7446 (2000); Copolymer 1 inhibits manifestations of graft rejection (with Aharoni, R., Teitelbaum, D. and Arnon, R.), *Transplantation*, 72, p. 598 (2001); Glatiramer acetate specific T-cells in the brain express Th2/3 cytokines as well as Brain derived neurotrophic factor (BDNF) in situ (with Aharoni, R., Kayhan, B., Eilam, R. and Arnon, R.), *Proc Natl. Acad. Sci.*, 100, p. 14157 (2003); Therapeutic vaccines - realities of today and hopes for the future (with Arnon, R. and Schechter, B.), *Drug Discovery Today*, 7, p. 664 (2002); From proteins and protein models to their use in immunology and Immunotherapy, *Reflections, J. Biol. Chem.*, 278, p. 48507 (2003).