Prof. Jean-Marie Lehn
Professor, Nobel Laureate in Chemistry, 1987

Most important awards, prizes and academies

Awards: Gold Medal of the Pontifical Academy of Sciences (1981); Gold Medal of the CNRS (1981); Paracelsus Prize of the Swiss Chemical Society (1982); Alexander von Humboldt Forschungspreis (1983); Prize of the Commissariat à l'Energie Atomique, Académie des Sciences (1984); Rolf-Sammet Prize, Frankfurt University (1985); Nobel Prize in Chemistry (1987); Karl-Ziegler Prize (1989); Bonner Chemiepreis (1993); 'Ettore Majorana Centre Erice Science for Peace' Prize (1994); Davy Medal (1997); Lavoisier Medal (1997); Messel Medal (1998); Giulio Natta Medal (2003). *Academies*: Member or Foreign Member or Honorary Member of 33 Academic bodies.

Summary of scientific research

Jean-Marie Lehn received his Doctorat-ès-Sciences in 1963 from the University of Strasbourg working in the laboratory of Guy Ourisson. The following year he joined the group of Robert Burns Woodward at Harvard University, where he participated in the total synthesis of vitamin B12. On his return to Strasbourg he started to work in areas on the frontier between organic and physical chemistry, later taking an interest in biological processes as well. In 1970 Lehn became Professor of Chemistry at the Université Louis Pasteur in Strasbourg and since 1979 he has been Professor at the Collège de France in Paris. The research work of Jean-Marie Lehn led in 1968 to the

synthesis of cage-like molecules that form inclusion complexes, the cryptates, with various metal ions. With this began his research on the chemical basis of 'molecular recognition' (i.e. the way in which a receptor molecule recognizes and selectively binds a substrate), which also plays a fundamental role in biological processes. For these studies Lehn received the Nobel Prize for Chemistry in 1987. In the 1975-85 period he also conducted research on the photochemical splitting of water and artificial photosynthesis for which he received the Pius XI Gold Medal of the Pontifical Academy of Sciences in 1981. Over the years, Lehn's main line of research has expanded from the studies on molecular recognition to the definition and exploration of a new field of chemistry, which he proposed calling 'supramolecular chemistry' as it deals with the complex entities formed by the association of two or more chemical species held together by intermolecular forces, whereas molecular chemistry studies the features of the entities constructed from atoms linked by covalent bonds. His work has also covered supramolecular catalysis, artificial enzymes and transport processes. It has further extended to the design of functional molecular and supramolecular devices belonging to the areas of molecular electronics, ionics and photonics. More recently a main line of development has been the design of 'programmed' systems that undergo self-organization by the spontaneous assembly of suitable components into well-defined supramolecular architec tures following an Aufbau plan. The long-range goal is the study and design of organized matter and the progressive build-up of complexity. The results of the work of Jean-Marie Lehn have been described in more than 700 scientific publications.

Main publications

Dietrich, B., Lehn, J.-M., Sauvage, J.-P., Les Cryptates, *Tet. Letters*, p. 2889 (1969); Lehn, J.-M., Nitrogen inversion: experiment and theory, *Fortschritte der chemischen Forschung*, 15, p. 311 (1970), Springer-Verlag; Lehn, J.-M., Design of organic complexing agents. Strategies towards properties, *Structure and Bonding*, 16, p. 1 (1973); Lehn, J.-M., Cryptates: the chemistry of macropolycyclic inclusion complexes, *Acc. Chem. Res.*, 11, p. 49 (1978); Lehn, J.-M., Cryptates: inclusion complexes of macropolycyclic receptor molecules, *Pure & Appl. Chem.*, 50, p. 871, 1978; Lehn, J.-M., Macrocyclic receptor moleculaes: Aspects of chemical reactivity. Investigations into molecular catalysis and transport processes, *Pure & Appl. Chem.*, 51, p. 979 (1979); Lehn, J.-M., Cryptate inclusion complexes. Effects on solute-solute and solute-solvent interactions and on ionic reactivity, *Pure & Appl. Chem.*, 52, p. 2303 (1980); Lehn, J.-M., Chemistry of transport processes - Design of synthetic carrier molecules, *Physical Chemistry of Transmembrane Ion Motions* (G. Spach, ed.), p. 181 (Elsevier, 1983); Lehn, J.-M., Supramolecular chemistry: Receptors, catalysts and carriers, *Science*, 227, p. 849 (1985); Lehn, J.-M., Supramolecular chemistry - Scope and perspectives. Molecules, supermolecules, and molecular devices, (*Nobel Lecture*, 8.12.1987), *Angew. Chem. Int. Ed. Engl.*, 27, pp. 89-112 (1988); Lehn, J.-M., Perspectives in supramolecular chemistry - From molecular recognition towards molecular information processing and self-organization, *Angew. Chem. Int. Ed. Engl.*, 29, p. 1304 (1990); Lehn, J.-M., Supramolecular Chemistry - Concepts and Perspectives, *VCH* (1995); Lehn, J.-M., Supramolecular chemistry/Science. Some conjectures and perspectives (R. Ungaro, E. Dalcanale,

eds), *Supramolecular Science: Where It is and Where It is Going*, Kluwer Academic Publisher, pp. 287-304 (1999); Lehn, J.-M., Dynamic combinatorial chemistry and virtual combinatorial libraries, *Chem. Eur. J.*, 5, pp. 2455-63 (1999); Lehn, J.-M., Programmed chemical systems: Multiple subprograms and multiple processing/expression of molecular information, *Chem. Eur. J.*, 6, pp. 2097-2102 (2000); Lehn, J.-M., Supramolecular Polymer Chemistry - Scope and Perspectives, *Supramolecular Polymers* (Alberto Ciferri, ed.), pp. 615-41 (2000); Lehn, J.-M., Toward complex matter: Supramolecular Chemistry and self-organization, *Proc. Natl. Acad. Sci. USA*, 99, pp. 4763-8 (2002); O. Ramström, J.-M. Lehn, Dynamic Ligand Assembly, *Comprehensive Medicinal Chemistry II*, D. Triggle, J. Taylor (eds), Elsevier, Ltd, Oxford, 959-76 (2007); D. Sarazin, M. Schmutz, J.-M. Guenet, A. Petitjean, J.-M. Lehn, Structure of Supramolecular Polymers Generated via Self-Assembly through Hydrogen Bonds, *Mol. Cryst. Liq. Cryst.*, 468, 187-201 (2007); E. Buhler, S.-J. Candau, E. Kolomiets, J.-M. Lehn, Dynamical Properties of Semidilute Solutions of Hydrogen-Bonded Supramolecular Polymers, *Physical Review E*, 76, 061804-1-061804-8 (2007); N. Sreenivasachary, J.-M. Lehn, Structural Selection in G-Quartet-Based Hydrogels and Controlled Release of Bioactive Molecules, *Chem. Asian J.*, 3, 134-9 (2008); D.T. Hickman, N. Sreenivasachary J.-M. Lehn, Synthesis of Components for the Generation of Constitutional Dynamic Analogues of Nucleic Acids, *Helv. Chim. Acta*, 91, 1-20 (2008); S. Ulrich, J.-M. Lehn, Reversible switching between macrocyclic and polymeric states by morphological control in a constitutional dynamic system, *Angew. Chem. Int. Ed.*, 47, 2240-3 (2008); A. Petitjean, L.A. Cuccia, M. Schmutz, J.-M. Lehn, Naphthyridine-based helical foldamers and macrocycles: Synthesis, cation binding, and supramolecular assemblies, *J. Org. Chem.*, 73, 2481-95 (2008); G. Pace, A. Petitjean, M.-N. Lalloz-Vogel, J. Harrowfield, J.-M. Lehn, P. Samori, Subnanometer-resolved patterning of bicomponent self-assembled monolayers on Au(111), *Angew. Chem. Int. Ed*. 47, 2484-8 (2008); Y. Ruff, J.-M. Lehn, Glycodynamers: Dynamic analogs of arabinofuranoside oligosaccharides, *Biopolymers*, 89, 486-96 (2008); Y. Ruff, J.-M. Lehn, Glycodynamers: Fluorescent dynamic analogues of polysaccharides, *Angew. Chem Int. Ed.*, 47, 3556-9 (2008); M. Barboiu, J.-M. Lehn, Helical Diastereomerism in Self-Organization of Molecular Strands, *Rev. Chim.* (Bucuresti), 59, 255-9 (2008).