Leopoldina
Nationale Akademie
der Wissenschaften

Curriculum Vitae Professor Dr Sir J. Fraser Stoddart

Name: **Sir James Fraser Stoddart**
Born: **24 Mai 1942**

Research Priorities: Supramolecular chemistry, physical organic chemistry, stereochemistry, molecular machines

Sir J. Fraser Stoddart is a British-American chemist. His research focus is on the synthesis of molecular machines that consist of molecules that can fulfil mechanical functions. For example, a molecular switch can be turned on and off again via external stimuli like light, electrical, or magnetic fields. Fraser Stoddart's research at the nanoscale has enormous potential for the development of new materials and appliances. In 2016, he was awarded the Nobel prize for chemistry together with the Dutch physicist Bernhard L. Feringa and the French chemist Jean-Pierre Sauvage.

Academic and Professional Career

2010 - 2020	Director, Center for the Chemistry of Integrated Systems (CCIS), Northwestern University, Evanston, USA
since 2008	Professor Emeritus for Chemistry, Northwestern University, Evanston, USA
2003 - 2007	Director, California NanoSystems Institute, Los Angeles, USA
2003 - 2008	Fred Kavli Professor for Nanoscience, University of California Los Angeles (UCLA), Los Angeles, USA
1997 - 2003	Professor of Organic Chemistry, UCLA, Los Angeles, USA
1990 - 1997	Professor of Organic Chemistry, University of Birmingham, Birmingham, UK
1981 - 1990	Reader in Chemistry, University of Sheffield, Sheffield, UK
1980	Doctor of Science
1978 - 1981	Researcher, Imperial Chemical Industries, London, UK

1970 - 1978	Lecturer in Chemistry, University of Sheffield, Sheffield, UK
1967 - 1970	Postdoc, Queen's University, Kingston, Canada
1966	PhD, University of Edinburgh, Edinburgh, UK
1964	Bachelor of Science, University of Edinburgh, Edinburgh, UK

Functions in Scientific Societies and Committees (Selection)

since 2018	Member, Faculty Honors Committee, Northwestern University, Evanston, USA
since 2018	Member, Editorial Advisory Board, ChemSystemsChem
2012 - 2016	Chairperson, Faculty Honors Committee, Northwestern University, Evanston, USA
since 2013	Member, International Advisory Board, Chemistry World
since 2013	Member, International Advisory Board, Macromolecular Rapid Communications
since 2013	Member, International Advisory Board, ChemPlusChem
since 2010	Chief Editor, Applied Nanoscience
since 2008	Member, Board of Trustees Professor of Chemistry, Northwestern University, Evanston, USA
2007 - 2012	Member, Scientific Advisory Board, Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley, USA
2007	Member, Departmental Awards Committee, UCLA, Los Angeles, USA
2004 - 2014	Member, American Chemical Society (ACS) Executive Director’s 2020 Committee, ACS, USA
2004 - 2006	Member, Research Advisory Council, UCLA, Los Angeles, USA
2004	Member, Wolf Prize in Chemistry Committee, Wolf Foundation, Herzlia Bet, Israel
2003 - 2005	Associate Editor, Organic Letters
2003	Member, Scientific Committee of the Nanoworld Institute, University of Genoa, Genoa, Italy
2003	Member, International Advisory Committee for Conference on Materials and Advanced Technologies, Singapore, Singapore
2000 - 2008	Member, Editorial Advisory Board, Crystal Growth and Design
1997 - 1999	Member, Departmental Awards Committee, UCLA, Los Angeles, USA
1992 - 1993	Chairperson, Chemistry Futures Group, University of Birmingham, Birmingham, UK

1991 - 1994 Chairperson, Science Faculty Industrial Liaison Panel, University of Birmingham, Birmingham, UK

Project Coordination, Memberships in Collaborative Research Projects (Selection)

2023 Principal Investigator, Project „An electric molecular motor“, National Science Foundation (NSF), Alexandria, USA

2022 Principal Investigator, Project „Automating glycan assembly in solution“, Northwestern University, Evanston, USA

2004 - 2007 Member, Materials Creation Training Programme, UCLA, Los Angeles, USA

Honours and Awarded Memberships (Selection)

2022 STEM Leadership Award for Propelling Science, Chemical Marketing & Economics, Inc., New York City, USA and National Aeronautics and Space Administration (NASA), USA

since 2021 Corresponding member, Australian Academy of Science, Canberra, Australia

since 2018 Member, Chinese Academy of Sciences (CAS), Beijing, China

2016 Nobel Prize in Chemistry (together with Bernard L. Feringa and Jean-Pierre Sauvage), Royal Swedish Academy of Science, Stockholm, Sweden

since 2014 Member, National Academy of Sciences, Washington D. C., USA

2014 Centenary Prize Winner, Royal Society of Chemistry, London, UK

since 2012 Member, American Academy of Arts and Sciences, Cambridge, USA

2012 Distinguished Citizen Award, Illinois Saint Andrew Society, Chicago, USA

2010 Royal Medal, Royal Society of Edinburgh, Edinburgh, UK

2008 Davy Medal, Royal Society, London, UK

2008 Arthur C. Cope Award, Arthur C. Cope Fund, ACS, USA

2007 Knight Bachelor, UK

2007 King Faisal International Prize, King Faisal Foundation, Riad, Saudi-Arabia

2007 Jabir ibn Hayyan (Geber) Medal, Saudi Chemical Society, Saudi-Arabia

2007 Tetrahedron Prize for Creativity in Organic Chemistry, Elsevier, Amsterdam, Netherlands

2007 Albert Einstein World Award of Science, World Cultural Council

2007 Feynman Prize in Nanotechnology, Foresight Institute, San Francisco, USA

since 2006	Foreign Member, Royal Netherlands Academy of Arts and Sciences (KNAW), Netherlands
2006	Edward Mack Jr. Memorial Award, Ohio State University, Columbus, USA
2006	Fusion Award, University of Nevada, Reno, USA
2006	Honorary Doctorate, University of Twente, Enschede, Netherlands
2005	Arthur K. Doolittle Award, Division of Polymeric Materials: Science and Engineering (PSME Division), ACS, USA
2005	Alumnus of the Year, University of Edinburgh, Edinburgh, UK
2005	Honorary Doctorate, University of Birmingham, Birmingham, UK
2005	Honorary Doctorate, East China University of Science and Technology, Shanghai, China
since 2005	Member, American Association for the Advancement of Science (AAAS), USA
2004	Nagoya Gold Medal in Organic Chemistry, MSD Life Science Foundation (Banyu), Tokyo, Japan
2000	Herbert Newby McCoy Award, Purdue University, West Lafayette, USA
since 1999	Member, German National Academy of Sciences Leopoldina
1999	Arthur C. Cope Scholar Award, ACS, USA
1995	Steinhofer Award, Albert-Ludwigs University Freiburg, Freiburg, Germany
1994	Chaire Bruylants Award, Katholieke Universiteit Leuven, Leuven, Belgium
since 1994	Member, Royal Society, UK
1993	International Izatt-Christensen Award in Macrocyclic Chemistry, IBC Advanced Technologies Inc., American Fork, USA
1980, 1981, 1982	Perkin Division Career Award, Royal Society of Chemistry, UK
1978	Chartered Chemist, Royal Society of Chemistry, UK
1978	Carbohydrate Chemistry Award, Royal Society of Chemistry, UK
since 1971	Member, ACS, USA
since 1965	Member, Royal Society of Chemistry, UK
1964	Hope Prize in Chemistry, University of Edinburgh, Edinburgh, USA

Research Priorities

Sir J. Fraser Stoddart is a British-American chemist. His research focus is on the synthesis of molecular machines that consist of molecules, which can fulfil mechanical functions. For example, a molecular switch can be turned on and off again via external stimuli like light, electrical, or magnetic fields. Fraser Stoddart's research at the nanoscale has enormous potential for the development of new materials and appliances. In 2016, he was awarded the Nobel prize for chemistry together with the Dutch physicist Bernhard L. Feringa and the French chemist Jean-Pierre Sauvage.

In Nature, molecular machines are nothing new, but they are in chemistry. Biological systems like enzymes and proteins turn chemical energy into mechanical energy. The most famous example of a natural molecular machine is adenosine triphosphate (ATP) -synthase. It produces ATP, which is the molecule that provides energy to the metabolism of living cells. In contrast to their natural models, the tiny molecular compounds, which are produced in the laboratory, are deliberately programmed and steered to fulfil specific tasks.

Building on the work of Jean-Pierre Sauvage, Fraser Stoddart worked towards developing molecular engines that perform rotating motions, not unlike the engine of a car. These engines, which are called rotaxanes, consist of multiple interconnected molecules that are arranged in a covalent network. By applying external forces, these molecules can turn in a certain direction and thus move.

Fraser Stoddart and his team focused on producing these machines through complex, multistage processes of synthesis. Among other things, they developed molecular Borromean rings, that consist of multiple interwoven circular molecules, during this process. If one of these rings is removed, all other rings disintegrate. Producing Borromean rings is a challenge because of the difficulties in weaving the three rings together so that they remain stable. In 1994, Fraser Stoddart developed the first Borromean ring from molecular building blocks and called it "Molecular Borromean Linkage".

Borromean rings bear great potential for the development of molecular machines as they can execute precise functions because of their complex and nonlinear structure. Fraser Stoddart and his team developed for example an artificial molecular muscle, which consists of Borromean rings. This special molecular machine can move by activating and deactivating specific chemical reactions.

Fraser Stoddart was awarded multiple awards for his work, amongst them the Nobel prize in chemistry in 2016. His work bears the potential to develop new materials and applications that can be controlled on a molecular level. Possible fields of application lie in medicine, electronics and energy production. As a renowned chemist, he significantly contributed to the theoretical advancement of supramolecular chemistry.