PONTIFICIA ACADEMIA SCIENTIARVM

THE AWARD

OF THE

PIUS XI GOLD MEDAL

2012

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The aim of the Pontifical Academy of Sciences, which was founded on 28 October 1936 by the Holy Father Pius XI, is to honour pure science, wherever this may be found, to ensure its freedom, and to support the research essential for the progress of applied science.

On 28 October 1961, on the occasion of the 25th anniversary of the foundation of the Pontifical Academy of Sciences, the Holy Father John XXIII established the Pius XI Gold Medal in honour of the founder of the Academy. The medal should be awarded to a young scientist who has already gained an international reputation.

The Council of the Academy unanimously decided to award the "Pius XI Gold Medal" for the year 2012 to

Prof. Ulrich Pöschl

in recognition of his great merits as a scholar and the important contribution of his research to scientific progress.


PIVS · XI · PONTIFEX · MAXIMVS · FVNDATOR
ACADEMIA · SCIENTIARVM · PONTIFICIA
ULRICH PÖSCHL
A.D.
MMXII

ULRICH PÖSCHL

BIOGRAPHICAL DATA

Full Name: Ulrich Pöschl

Work Address:
Max Planck Institute for Chemistry
Hahn-Meitner-Weg 1, D-55128 Mainz, Germany

Scientific Discipline:
Chemistry, Climate and Earth System Science, Public Health

Date of Birth: 9 October 1969

Place of Birth: Klagenfurt, Austria

Wife and Children: Married to Dr. Andrea Pöschl (neé Buttenhauser); Carina Maria Pöschl

Professional Interests:
Scientific research & teaching: multiphase chemistry in the Earth system, climate and public health. Scientific communication & quality assurance: interactive open access publishing & public peer review.

Professional Career:
from 10/2012 *Max Planck Institute for Chemistry, Mainz, Germany*. Director of the newly founded Multiphase Chemistry Department. Research & teaching: multiphase chemistry in the Earth system, climate and public health, i.e., chemical reactions, mass transport and phase transitions of gases, liquids and solids linking the atmosphere, biosphere and hydrosphere on molecular to global scales. Focal points: biological and organic aerosols, aerosol-cloud interactions, reactive oxygen species, protein nitration and oxidation, allergic reactions. Methods: environmental observations, laboratory experiments, mathematical models.

since 2007 *Johannes Gutenberg University, Mainz, Germany.* Faculty member of the Department of Chemistry, Pharmacy and Geosciences. Habilitation & venia legendi in Geochemistry (17.01.2007).

2005-2012 *Max Planck Institute for Chemistry, Mainz, Germany.* Research group leader in the Biogeochemistry Department (M.O. Andreae). Research & teaching: chemistry, physics and biology of aerosols and clouds; biogeochemical cycling of gases and particles; field measurements, kinetic and thermodynamic experiments and models.

1999-2005 *Technical University of Munich, Germany.* Research group leader at the Institute of Hydrochemistry (R. Niessner) and head of an independent junior research group. Habilitation & venia legendi in Chemistry (21.06.2006). Research & teaching: analytical and physical chemistry, environmental science and technology; formation, aging and measurement of aerosols and nanoparticles in ambient air and combustion exhaust.

1997-1998 *Max Planck Institute for Chemistry, Mainz, Germany.* Research scientist in the group of P.J. Crutzen, Atmospheric Chemistry Department. Research: reaction mechanisms and numerical simulation of atmospheric chemistry and transport; photochemistry of ozone and organic trace gases; polar stratospheric clouds and denitrification.

1996-1997 *Massachusetts Institute of Technology, Cambridge, MA, USA.* Postdoctoral fellow in the group of M.J. Molina, Atmospheric Chemistry Laboratory & Center for Global Change Science, Department of Chemistry and Department of Earth, Atmospheric and Planetary Sciences. Research: experimental chemical kinetics and mass spectrometry; formation and condensation of sulfuric acid.

1993-1996 *Technical University of Graz, Austria*. Research assistant in the group of K. Hassler, Institute of Inorganic Chemistry. Research: organometallic chemistry and molecular spectroscopy; synthesis and structure elucidation of cyclic silicon compounds.

Miscellaneous Professional Activities:

Lecturer & student advisor at the Technical Universities of Munich and Vienna (1999-2005), International Max Planck Research School (since 2005), and University of Mainz (since 2007).

Quality assurance manager, Institute of Hydrochemistry, Technical University of Munich (2000-2005).

Referee for international scientific journals and funding organizations (since 1996).

Coordinator of international scientific projects and conferences (since 2000).

Initiator and promoter of interactive open access publishing with a two-stage process of publication, public peer review, and interactive discussion (since 2000).

Founder and chief executive editor of the international scientific journal Atmospheric Chemistry and Physics (ACP), www.atmos-chem-phys.net (since 2001).

Atmospheric sciences division president (2003-2007), council member (since 2003), and publications committee chair (since 2007) of the European Geosciences Union (EGU), www.egu.eu.

Education:

1993-1995 *Doctoral Studies in Chemistry, Technical University of Graz, Austria.* Doctoral thesis at the Institute of Inorganic Chemistry (K. Hassler) on the subject "Synthesis, spectroscopy, and structure of selectively functionalized cyclosilanes"; doctoral exams (07.11.1995) and graduation with distinction as "Doctor technicae" (PhD equivalent).

1991-1993 *Diploma Studies in French, Karl Franzens University of Graz, Austria.* Institute of Romance Languages.

1988-1993 *Diploma Studies in Technical Chemistry, Technical University of Graz, Austria.* Diploma thesis at the Institute of Inorganic Chemical Technology (G. Herzog) on the subject "Thermoelectricity of oxidic semiconductor ceramics"; diploma exams (04.06.1993) and graduation with distinction as "Diplom-Ingenieur" (MSc equivalent).

1980-1988 *Secondary School, Klagenfurt, Austria.* Foreign language focus (English, French, Latin), final exams (23.06.1988) and graduation with distinction.

1976-1980 *Elementary School, Klagenfurt, Austria.*

Awards and Scholarships:

2005 Union Service Award of the European Geosciences Union.

2000 Young Scientist Award of the German Federal Ministry of Education and Research.

1996 Schrödinger Scholarship of the Austrian Science Foundation; Research Awards of the Austrian Federal Minister of Arts and Science, the Industrial Union of Carinthia and the Josef Krainer Foundation; Graduation "Sub Auspiciis Praesidentis" by the Austrian Federal President (highest award in the Austrian educational system).

1991-1994 Student and research scholarships of the Technical University of Graz, the Pro Scientia Foundation, and the Austrian Science Foundation.

BRIEF ACCOUNT OF SCIENTIFIC ACTIVITY

The scientific activities of Dr. Ulrich Pöschl encompass the chemistry, physics and biology of the Earth system, climate and public health. His research and teaching deal primarily with multiphase processes, i.e., chemical reactions, mass transport and phase transitions of gaseous, liquid and solid substances linking the atmosphere, biosphere and hydrosphere on molecular to global scales. Focal points are biological and organic aerosols, aerosol-cloud interactions, reactive oxygen species, protein nitration and oxidation, and allergic reactions. The multidisciplinary approach of Dr. Pöschl is to address and combine physical, chemical and biological questions and techniques in environmental observations, laboratory experiments, and mathematical models. His major academic achievements include: (a) global measurements and modeling of biogenic aerosols and cloud condensation nuclei; (b) a universal kinetic model framework and master mechanism of multiphase chemistry and gas-particle interactions in aerosols and clouds; (c) the detection of amorphous solid phases and moisture-induced phase transitions in organic aerosol particles; (d) the discovery of protein nitration as a molecular rationale for the enhancement of allergic diseases by air pollution; (e) the development of interactive open access publishing with a two-stage publication process, public peer review and interactive discussion for improved scientific communication and quality assurance. The results and success of Dr. Pöschl's scientific activities are documented in more than a hundred peer-reviewed journal articles that received over four thousand citations, and in several hundred contributions to conferences, proceedings, and books.

(http://www.researcherid. com/rid/A-6263-2010).

SELECTED PUBLICATIONS

Pöhlker, C., Wiedemann, K.T., Sinha, B., Shiraiwa, M., Gunthe, S. S., Smith, M., Su, H., Artaxo, P., Chen, Q., Cheng, Y., Elbert, W., Gilles, M.K;., Kilcoyne, A.L.D., Moffet, R.C., Weigand, M., Martin, S.T., Pöschl, U., and Andreae, M.O.: Biogenic potassium salt particles as seeds for secondary organic aerosol in the Amazon, *Science*, 337, 1075-1078, 2012.

Elbert, W., Weber, B., Burrows, S., Steinkamp, J., Büdel, B., Andreae, M.O., and Pöschl, U.: Contribution of cryptogamic covers to the global cycles of carbon and nitrogen, *Nature Geoscience*, 5, 459-462, 2012.

Shiraiwa, M., Pfrang, C., Koop, T., and Pöschl, U.: Kinetic multilayer model of gas-particle interactions in aerosols and clouds (KM-GAP): linking condensation, evaporation and chemical reactions of organics, oxidants and water, *Atmospheric Chemistry and Physics*, 12, 2777-2794, 2012.

Shiraiwa, M., Selzle, K., and Pöschl, U.: Hazardous components and health effects of atmospheric aerosol particles: reactive oxygen species, soot, polycyclic aromatic compounds, and allergenic proteins, *Free Radical Research*, 46, 927-939, 2012.

Pöschl, U.: Multi-stage open peer review: scientific evaluation integrating the strengths of traditional peer review with the virtues of transparency and self-regulation, *Frontiers in Computational Neuroscience*, DOI: 10.3389/fncom.2012.00033, 2012.

Su, H., Cheng, Y., Oswald, R., Behrendt, T., Trebs, I., Meixner, F.X., Andreae, M.O., Cheng, P., Zhang, Y., and Pöschl, U.: Soil nitrite as a source of atmospheric HONO and OH radicals, *Science*, 333, 1616-1618, 2011.

Shiraiwa, M., Ammann, M., Koop, T., and Pöschl, U: Gas uptake and chemical aging of semi-solid organic aerosol particles, *Pro-*

ceedings of the National Academy of Sciences, 108, 11003 - 11008, 2011.

Shiraiwa, M., Sosedova, Y., Rouvière, A., Yang, H, Zhang, Y., Abbatt, J. P. D., Ammann, M., and Pöschl, U.: The role of long-lived reactive oxygen intermediates in the reaction of ozone with aerosol particles, *Nature Chemistry*, 3, 291-295, 2011.

Zhang, Y.Y., Yang, H., and Pöschl, U.: Analysis of nitrated proteins and tryptic peptides by HPLC-chip-MS/MS: site-specific quantification, nitration degree, and reactivity of tyrosine residues, *Analytical and Bioanalytical Chemistry*, 399, 459-471, 2011.

Pöschl, U., Martin, S.T., Sinha, B., Chen, Q., Gunthe, S.S., Huffman, J.A., Borrmann, S., Farmer, D.K., Garland, R.M., Helas, G., Jimenez, J.L., King, S.M., Manzi, A., Mikhailov, E., Pauliquevis, T., Petters, M.D., Prenni, A.J., Roldin, P., Rose, D., Schneider, J., Su, H., Zorn, S.R., Artaxo, P., and Andreae, M.O.: Rainforest aerosols as biogenic nuclei of clouds and precipitation in the Amazon, *Science*, 429, 1513-1516, 2010.

Virtanen, A., Joutsensaari, J., Koop, T., Kannosto, J., Yli-Pirilä, P., Leskinen, J., Mäkelä, , J.M., Holopainen, J.K., Pöschl, U., Kulmala, M., Worsnop, D.R., and Laaksonen, A.: An amorphous solid state of biogenic secondary organic aerosol particles, *Nature*, 467, 824-827, 2010.

Mikhailov, E., Vlasenko, S., Martin, S.T., Koop, T., and Pöschl, U.: Amorphous and crystalline aerosol particles interacting with water vapour: conceptual framework and experimental evidence for restructuring, phase transitions and kinetic limitations, *Atmospheric Chemistry and Physics*, 9, 9491-9522, 2009.

Fröhlich-Nowoisky, J., Pickersgill, D.A., Despés, R.V., Pöschl, U.: High diversity of fungi in air particulate matter, *Proceedings of the National Academy of Sciences*, 106, 12814-12819, 2009.

Rose, D., S.S. Gunthe, E. Mikhailov, G.P. Frank, U. Dusek, M.O. Andreae, U. Pöschl, Calibration and measurement uncertainties

of a continuous-flow cloud condensation nuclei counter (DMT-CCNC): CCN activation of ammonium sulfate and sodium chloride aerosol particles in theory and experiment, *Atmospheric Chemistry and Physics*, 8, 1153-1179, 2008.

Pöschl, U., Y. Rudich, M. Ammann, Kinetic model framework for aerosol and cloud surface chemistry and gas-particle interactions - Part 1: General equations, parameters, and terminology, *Atmospheric Chemistry and Physics*, 7, 5989–6023, 2007.

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Messerer, A., R. Niessner, U. Pöschl, Comprehensive kinetic characterisation of the oxidation and gasification of model and real diesel soot by nitrogen oxides and oxygen under diesel engine exhaust conditions: measurement, Langmuir-Hinshelwood, and Arrhenius parameters, *Carbon*, 44, 307-324, 2006.

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Franze, T., M.G. Weller, R. Niessner, U. Pöschl, Protein nitration by polluted air, *Environmental Science and Technology*, 39, 1673-1678, 2005.

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