

# Curriculum Vitae – Univ.-Prof. Dr. rer. nat. Rolf Breinbauer

## 1 – Person / Allgemeine Angaben

<b>Name</b>	Rolf Breinbauer, Univ.-Prof. Dr. rer. nat., *28.11.1970, male
<b>Nationality</b>	Austrian
<b>Address</b>	Institut für Organische Chemie, Technische Universität Graz Stremayrgasse 9, A-8010 Graz, Austria Phone: +43 (0) 316 873 32400, E-Mail: <a href="mailto:breinbauer@tugraz.at">breinbauer@tugraz.at</a>
<b>Position</b>	Full professor

## 2 – Academic Education / Akademische Ausbildung mit Abschluss

1995 - 1998	PhD thesis: “Metal Colloids as Catalysts” Max-Planck-Institut für Kohlenforschung, Mülheim/Ruhr and University of Bochum, Germany (“summa cum laude”)
1989 - 1995	Study in Technical Chemistry, Vienna University of Technology, Austria diploma exams: “with distinction” including the diploma thesis (04-10/1994): “Enantioselektive Pd-katalysierte allylische Substitution von Indenyl-Substraten.” University of Heidelberg, Germany

## 3 – Scientific Degrees / Wissenschaftliche Abschlüsse

1998	Promotion (Dr. rer. nat.), University of Bochum
1995	Diploma (Technical Chemistry), Vienna University of Technology

## 4 – Academic Appointments / Beruflicher Werdegang ab Studienabschluss

since 2007	Full Professor, Institute of Organic Chemistry, Graz University of Technology, Austria
2005 - 2007	Professor (W2), Institute of Organic Chemistry, University of Leipzig, Germany
2003 - 2005	Junior Professor for Organic and Bioorganic Chemistry, University of Dortmund, Germany
2000 - 2005	Group Leader, Max-Planck-Institute for Molecular Physiology, Dortmund, Germany
1998 - 1995	Post-doctoral Fellow, Department of Chemistry and Chemical Biology, Harvard University, Cambridge/MA, USA

## 5 – Additional information / Sonstiges

since 2011	Member of the Scientific Board (Kuratorium), Austrian Science Fund (FWF)
since 2008	Member of the Selection Committee for Scholarships of the Austrian Academy of Sciences
since 2008	Key Research in the Austrian Centre of Industrial Biotechnology
2002 - 2005	Member of the Scientific Council of the Max-Planck-Society, and Member of the Biological-Medical Section of the Max-Planck-Society, Germany

**6 – Honors ▪ Awards / Preise und Auszeichnungen**

2007	Call for Full Professorship Organic Chemistry, University of Linz/A
2002	Thieme Chemistry Journal Award
2000 - 2003	Liebig-Scholarship (Fonds der Chemischen Industry)
1998 – 1999	Erwin-Schrödinger-Post-doctoral Fellowship

**7 – Externally funded projects / geförderte Drittmittelprojekte (last 5 years)**

2015 - 2018	International project I 2712 - Austrian Science Fund (FWF) “Electrooxidative Synthesis of Bis- and Oligoarenes” amount of funding: 174 k€
2015 - 2018	Stand-alone project P 28286 - Austrian Science Fund (FWF) “Development of Small Molecule Inhibitors Targeting Human Adipose Triglyceride Lipase” amount of funding: 356 k€
2014 - 2017	ERA-Synbio Project I 1722 - Austrian Science Fund (FWF) “A twofold retrosynthetic implementation of a novel biochemical pathway (RETROBIO)” amount of funding: 155 k€
2014 – 2017	principal investigator in the international PhD program “Doktoratskolleg DK: Molecular Enzymology” W901 - funding period 4 - Austrian Science Fund (FWF) total amount of funding: 4.200 k€ for 15 principal investigators
2012 – 2015	Innovative Medicines Initiative (Chem 21) – European Union “Biocatalytic Synthesis of Active Pharmaceutical Ingredients” amount of funding: 216 k€
2011 – 2014	ERA-Chemistry Project I 668 - Austrian Science Fund (FWF) “Exploring and Controlling Phenazine Biosynthesis with Chemical Biology” amount of funding: 150 k€
2011 – 2014	principal investigator in the international PhD program “Doktoratskolleg DK: Molecular Enzymology” W901 - funding period 3- Austrian Science Fund (FWF) total amount of funding: 4.000 k€ for 17 principal investigators
2010 – 2019	Key researcher in Austrian Centre of Industrial Biotechnology, COMET-K2 (FFG) amount of funding: 800 k€
2008 – 2011	principal investigator in the international PhD program “Doktoratskolleg DK: Molecular Enzymology” W901 - funding period 2- Austrian Science Fund (FWF) total amount of funding: 3.420 k€ for 15 principal investigators

**8 – Publications / Publikationen**

- R. Birner-Gruenberger, **R. Breinbauer**. Tracking protein S-fatty acylation with proteomics. *ChemBioChem*. 2016, 17. DOI: 10.1002/cbic.201600314, accepted
- R. Breinbauer**, M. Peters. Future Directions of Modern Organic Synthesis. in A. Zagfros (Ed.) “From Biosynthesis to Total Synthesis”, Wiley, Hoboken, 2016, 519-547.
- C. M. Pichler, J. Krysiak, **R. Breinbauer**. Target identification of covalently binding drugs by activity-based protein profiling (ABPP). *Bioorg. Med. Chem.* 2016, DOI: 10.1016/j.bmc.2016.03.050

- P. Aschauer, S. Rengachari, J. Lichtenegger, M. Schittmayer, K. M. Das, N. Mayer, **R. Breinbauer**, R. Birner-Gruenberger, C. C. Gruber, R. Zimmermann; K. Gruber, M. Oberer\*. Crystal structure of the *Saccharomyces cerevisiae* monoglyceride lipase Yju3p. *Biochim. Biophys. Acta*. 2016. DOI: 10.1016/j.bbali.2016.02.005, accepted
- A. Pellis, K. Haernvall, C. M. Pichler, G. Ghazaryan, **R. Breinbauer**, G. M. Guebitz. Enzymatic hydrolysis of poly(ethylene furanoate). *J. Biotechnol.* 2016, DOI: 10.1016/j.jbiotec.2016.02.006, accepted
- J. Pletz, B. Berg, **R. Breinbauer**. A General and Direct Reductive Amination of Aldehydes and Ketones with Electron-Deficient Anilines. *Synthesis* 2016, 48, 1301-1317. DOI: 10.1055/s-0035-1561384
- C. Doler, M. Schweiger, R. Zimmermann, **R. Breinbauer**. Chemical Genetic Approaches for the Investigation of Neutral Lipid Metabolism. *ChemBioChem*. 2016, 17, 358–377. DOI: 10.1002/cbic.201500501
- M. Trobe, **R. Breinbauer**. Improved and Scalable Synthesis of Building Blocks for the Modular Synthesis of Teraryl-based alpha-Helix Mimetics. *Monatsh. Chem.* 2016, 147, 509-521. DOI: 10.1007/s00706-015-1599-0
- R. Breinbauer**, M. Peters. Reductions of Carboxylic Acids and Derivatives. in O. Hammerich, B. Speiser (Eds.) "Organic Electrochemistry", CRC Press, Boca Raton, 2016, 1249-1265.
- M. A. Pribasnig, I. Mrak, G. F. Grabner, U. Taschler, O. Knittelfelder, B. Scherz, T. O. Eichmann, C. Heier, L. Grumet, J. Kowaliuk, M. Romauch, S. Holler, F. Anderl, H. Wolinski, A. Lass, **R. Breinbauer**, G. Marsche, J. M. Brown, R. Zimmermann.  $\alpha/\beta$  Hydrolase Domain-Containing 6 (ABHD6) Degrades the Late Endosomal/Lysosomal Lipid Bis(monoacylglycero)phosphate. *J. Biol. Chem.* 2015, 290, 29869-29881. DOI : 10.1074/jbc.M115.669168
- X. Yu, N. Guttenberger, E. Fuchs, M. Peters, H. Weber, **R. Breinbauer**. Diversity-Oriented Synthesis of a Library of Star-Shaped 2H-Imidazolines. *ACS Comb. Sci.* 2015, 17, 682–690. DOI: 10.1021/acscmbosci.5b00107
- J. Ivkovic, C. Lembacher-Fadum, **R. Breinbauer**. A rapid and efficient one-pot method for the reduction of N-protected alpha-amino acids to chiral alpha-amino aldehydes using CDI/DIBAL-H. *Org. Biomol. Chem.* 2015, 13, 10456-10460. DOI: 10.1039/C5OB01838B
- M. Leybold, P. W. Wallace, M. Kljajic, M. Schittmayer, J. Pletz, C. Illaszewicz-Trattner, G. M. Guebitz, R. Birner-Gruenberger, **R. Breinbauer**. A robust and simple protocol for the synthesis of arylfluorophosphonates. *Tetrahedron Lett.* 2015, 56, 5619-5622. DOI 10.1016/j.tetlet.2015.08.061
- K. Fesko, G. A. Strohmeier, **R. Breinbauer**. Expanding the threonine aldolase toolbox for the asymmetric synthesis of tertiary  $\alpha$ -amino acids. *Appl. Microbiol. Biotechnol.* 2015, 99, 9651-9661. DOI 10.1007/s00253-015-6803-y
- A. Pellis, E. Herrero Acero, H. Weber, M. Obersriebnig, **R. Breinbauer**, E. Srebotnik, G. M. Guebitz. Biocatalyzed approach for the surface functionalization of poly(L-lactic acid) films using hydrolytic enzymes. *Biotechnol. J.* 2015, 10, 1739-1749. DOI: 10.1002/biot.201500074
- P. Hofer, A. Boeszoermenyi, D. Jaeger, U. Feiler, H. Arthanari, N. Mayer, F. Zehender, G. Rechberger, M. Oberer, R. Zimmermann, A. Lass, G. Haemmerle, **R. Breinbauer**, R. Zechner, K. Preiss-Landl. Fatty acid-binding proteins interact with comparative gene identification-58 linking lipolysis with lipid ligand shuttling. *J. Biol. Chem.* 2015, 290, 18438-18453. DOI: 10.1074/jbc.M114.628958
- R. Birner-Gruenberger, **R. Breinbauer**. Weighing the Proteasome for Covalent Modifications. *Chem. Biol.* 2015, 22, 315-316. DOI: 10.1016/j.chembiol.2015.03.003

- N. Mayer, M. Schweiger, M.-C. Melcher, C. Fledelius, R. Zechner, R. Zimmermann, **R. Breinbauer**. Structure-activity studies in the development of a hydrazone based inhibitor of adipose-triglyceride lipase (ATGL). *Bioorg. Med. Chem.* 2015, 23, 2904-2916. DOI: 10.1016/j.bmc.2015.02.051
- U. Taschler, R. Schreiber, C. Chitraju, G. F. Grabner, M. Romauch, H. Wolinski, G. Haemmerle, **R. Breinbauer**, R. Zechner, A. Lass, R. Zimmermann. Adipose triglyceride lipase is involved in the mobilization of triglyceride and retinoid stores of the hepatic stellate cells. *Biochim. Biophys. Acta, Mol. Cell Biol. Lipids* 2015, 1851, 937-945. DOI: 10.1016/j.bbalip.2015.02.017
- G. Schneditz, J. Rentner, S. Roier, J. Pletz, K. A.T. Herzog, R. Bucker, H. Troeger, S. Schild, H. Weber, **R. Breinbauer**, G. Gorkiewicz, C. Högenauer, E. L. Zechner. Enterotoxicity of a nonribosomal peptide causes antibiotic-associated colitis. *Proc. Natl. Acad. Sci. U.S.A.* 2014, 111, 13181-13186. DOI:10.1073/pnas.1403274111
- A. Gutmann, L. Bungaruang, H. Weber, M. Leypold, **R. Breinbauer**, B. Nidetzky. Towards green synthesis of glycosylated dihydrochalcone natural products using glycosyltransferase-catalysed cascade reactions. *Green Chem.* 2014, 16, 4417-4425. DOI: 10.1039/C4GC00960F
- J. Rentner, M. Klajjic, L. Offner, **R. Breinbauer**. Recent advances and applications of reductive desulfurization in organic synthesis. *Tetrahedron* 2014, 70, 8983-9027. DOI:10.1016/j.tet.2014.06.104
- J. Rentner, **R. Breinbauer**, M. Gruber-Khadjawi. *Enzymes in Organic Synthesis*. Kirk-Othmer Encyclopedia of Chemical Technology, John-Wiley&Sons, 2014, 43 pages. DOI: 10.1002/0471238961.0514262526011119.a01.pub2
- M. Tösch, **R. Breinbauer**, K. Faber. Stereochemistry and Mechanism of Enzymatic and Non-Enzymatic Hydrolysis of Benzylic sec-Sulfate Esters. *Eur. J. Org. Chem.* 2014, 3930-3934. DOI: 10.1002/ejoc.201402211
- M. Trobe, M. Peters, S. H. Grimm, **R. Breinbauer**. The Development of a Modular Synthesis of Teraryl-based alpha-Helix Mimetics as Potential Inhibitors of Protein-Protein Interactions. *Synlett* 2014, 25, 1202-1214. DOI: 10.1055/s-0033-1340740
- S. M. Pratter, J. Ivkovic, R. Birner-Gruenberger, **R. Breinbauer**, K. Zangger, G. D. Straganz. More than just a Halogenase: Modification of Fatty Acyl Moieties by a Trifunctional Metal Enzyme. *ChemBioChem* 2014, 15, 567-574. DOI: 10.1002/cbic.201300345
- S. Rengachari, P. Aschauer, M. Schittmayer, N.Mayer, K.Gruber, **R. Breinbauer**, R. Birner-Gruenberger, I. Dreveny, M. Oberer. Conformational plasticity and ligand binding of bacterial monoacylglycerol lipase. *J. Biol. Chem.* 2013, 288, 31093-31104. DOI: 10.1074/jbc.M113.491415
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- K. Fesko, K. Steiner, **R. Breinbauer**, H. Schwab, M. Schürmann, G. A. Strohmeier. Investigation of one-enzyme systems in the w-transaminase-catalyzed synthesis of chiral amines. *J. Mol. Catal. B: Enzym.* 2013, 96, 103-110. DOI:10.1016/j.molcatb.2013.06.015
- E. Brehm, **R. Breinbauer**. Investigation of the origin and synthetic application of the pseudodilution effect for Pd-catalyzed macrocyclisations in concentrated solutions with immobilized catalysts. *Org. Biomol. Chem.* 2013, 11, 4750-4756. DOI: 10.1039/C3OB41020J
- H. Schröder, G. A. Strohmeier, M. Leypold, T. Nuijens, P. J. L. M. Quaedflieg, **R. Breinbauer**. Racemization-Free Chemoenzymatic Peptide Synthesis Enabled by the Ruthenium-Catalyzed Synthesis of Peptide Enol Esters via Alkyne-Addition and

- Subsequent Conversion Using Alcalase-Cross-Linked Enzyme Aggregates. *Adv. Synth. Catal.* 2013, 355, 1799-1807. DOI: 10.1002/adsc.201200423
- M. Peters, M. Trobe, **R. Breinbauer**. A Modular Synthesis of Teraryl-based  $\alpha$ -Helix Mimetics, Part 2: Synthesis of 5-Pyridine Boronic Acid Pinacol Ester Building Blocks with Amino Acid Side Chains in 3-Position. *Chem. Eur. J.* 2013, 19, 2450-2456. DOI: 10.1002/chem.201203006
- M. Peters, M. Trobe, H. Tan, R. Kleineweischede, **R. Breinbauer**. A Modular Synthesis of Teraryl-based  $\alpha$ -Helix Mimetics, Part 1: Synthesis of Core Fragments with two Electronically Differentiated Leaving Groups. *Chem. Eur. J.* 2013, 19, 2442-2449. DOI: 10.1002/chem.201203005
- J. Rentner **R. Breinbauer**. An efficient labelling strategy of drug like molecules with functionalized alkyl linkers using CH-activation. *Chem. Commun.* 2012, 48, 10343-10345. DOI:10.1039/c2cc35758e
- J. M. Krysiak, J. Kreuzer, P. Macheroux, A. Hermetter, S.A. Sieber, **R. Breinbauer**. Novel activity-based probes for studying the activity of flavin-dependent oxidases and for the protein target profiling of MAO-inhibitors. *Angew. Chem.* 2012, 124, 7142–7147; *Angew. Chem. Int. Ed.* 2012, 51, 7035-7040. DOI: 10.1002/anie.201201955
- J. Krysiak, **R. Breinbauer**. Activity Based Protein Profiling for Natural Product Target Discovery. *Topics Curr. Chem.* 2012, 324, 43-84. DOI: 10.1007/128\_2011\_289
- M. Mentel, M. Peters, J. Albering, **R. Breinbauer**. The Witkop-Winterfeldt Oxidation converts tetrahydropyridoindoles into pyrroloquinolones and cinnolines by an unprecedented scaffold rearrangement. *Tetrahedron* 2011, 67, 965-970. DOI: 10.1016/j.tet.2010.11.110
- M. Peters, **R. Breinbauer**. A simple synthesis of functionalized 3-methyl-1-pyridinyl-1H-imidazolium salts as bidentate N-heterocyclic-carbene precursors and their application in Ir-catalyzed arene borylation. *Tetrahedron Lett.* 2010, 51, 6622-6625. DOI: 10.1016/j.tetlet.2010.10.059
- R. Breinbauer**, M. Mentel. Combinatorial Chemistry and the Synthesis of Compound Libraries. in A. C. A. Roque (Ed.) "Ligand-Macromolecular Interactions in Drug Discovery: Methods and Protocols, Methods in Molecular Biology, Vol. 572", Humana Press, New York, 2010, 73-80. DOI: 10.1007/978-1-60761-244-5\_5
- D. Weinrich, P. Jonkheijm, M. Köhn, U. Westerlin, L. Dehmelt, H. Engelkamp, P. C. M. Christianen, J. Kuhlmann, J. C. Maan, D. Nüsse, H. Schröder, R. Wacker, E. Voges, **R. Breinbauer**, H. Kunz, C. M. Niemeyer, H. Waldmann. Preparation of Biomolecule Microstructures and Microarrays by Thiol-ene Photoimmobilization. *ChemBioChem* 2010, 11, 235-247. DOI: 10.1002/cbic.200900559
- M. Mentel, W. Blankenfeldt, **R. Breinbauer**. A New Type of Binding for Chiral Drugs - The Active Site of an Enzyme can Host both Enantiomers of a Racemic Ligand simultaneously. *Angew. Chem.* 2009, 121, 9248-9251; *Angew. Chem. Int. Ed.* 2009, 48, 9084-9087. DOI: 10.1002/anie.200902997
- M. Mentel, E. G. Ahuja, D. V. Mavrodi, **R. Breinbauer**, L. S. Thomashow, W. Blankenfeldt. Of Two Make One: The Biosynthesis of Phenazines. *ChemBioChem* 2009, 10, 2295-2304. DOI:10.1002/cbic.200900323
- M. Mentel, A. M. Schmidt, M. Gorray, P. Eilbracht, **R. Breinbauer**. Polystyrene Sulfonyl Chloride: A Highly Orthogonal Linker Resin for the Synthesis of Nitrogen-Containing Heterocycles. *Angew. Chem.* 2009, 121, 5955-5958; *Angew. Chem. Int. Ed.* 2009, 48, 5841-5844. DOI: 10.1002/anie.200901643
- M. Mentel, M. J. Beier, **R. Breinbauer**. An Environmentally Benign Electrochemical Process for the Reduction of Carboxylic Acid Hydrazides to Amides. *Synthesis* 2009, 1463-1468. DOI: 10.1055/s-0028-1088164

- R. Breinbauer**, M. Mentel. The Introduction of Chemical Reporter Groups by Bioorthogonal Ligation Reactions for the Imaging of Cell-Surface Glycans in H. Waldmann, P. Janning (Eds.) "Chemical Biology – Learning through Case Studies", Wiley-VCH, Weinheim, 2009, 221-232.
- R. Breinbauer**, M. Mentel. The Use of Photoaffinity Labeling for the Identification of the Binding Site of the Antibiotic Linezolid. in H. Waldmann, P. Janning (Eds.) "Chemical Biology – Learning through Case Studies", Wiley-VCH, Weinheim, 2009, 79-88.
- R. Breinbauer**. Solid-Phase Synthesis of Biomolecules. in T. P. Begley (Ed.) "Wiley Encyclopedia of Chemical Biology", Vol. 4, Wiley, Hoboken, 2009, 354-361.
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- M. Mentel, **R. Breinbauer**. Electrons as a Reagent in Solid-Phase Organic Synthesis. *Eur. J. Org. Chem.* 2007, 4283-4292.
- M. Mentel, **R. Breinbauer**. Combinatorial Solid Phase Natural Product Chemistry. *Topics Curr. Chem.* 2007, 278, 209-241.
- R. Breinbauer**, A. Hillisch, H. Waldmann. Reverse Chemical Genetics – An Important Strategy for the Study of Protein Function in Chemical Biology and Drug Discovery. in S. L. Schreiber, T. Kapoor, G. Wess (Eds.) "Chemical Biology", Wiley-VCH, Weinheim, 2007, 355-384.
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- S. Nad, **R. Breinbauer**. Electroorganic Synthesis of 2,5-Dialkoxydihydrofurans and Pyridazines on Solid Phase using Polymer Beads as Supports. *Synthesis* 2005, 3654-3665.
- E. Gonthier, **R. Breinbauer**. Solid-supported Reagents and Catalysts for the Preparation of Large Ring Compounds. *Mol. Diversity* 2005, 9, 51-62.
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- M. Westhus, E. Gonthier, D. Brohm, **R. Breinbauer**. An efficient and inexpensive scavenger resin for Grubbs' catalyst. *Tetrahedron Lett.* 2004, 45, 3141-3142.
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- R. Breinbauer**, M. Köhn, C. Peters in C. Schmuck, H. Wennemers (Eds.). "Small molecule arrays. In "Highlights in Bioorganic Chemistry ", Wiley-VCH, Weinheim, 2004, 485-500.
- M. Köhn, R. Wacker, C. Peters, H. Schröder, L. Soulere, **R. Breinbauer**, C. M. Niemeyer, H. Waldmann. Staudinger-Ligation: A new Immobilization Strategy for the Preparation of Small Molecule Arrays. *Angew. Chem.* 2003, 115, 6010-6014; *Angew. Chem. Int. Ed.* 2003, 42, 5830-5834.
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- M. A. Koch, **R. Breinbauer**, H. Waldmann. Protein Structure Similarity as Guiding Principle for Combinatorial Library Design. *Biol. Chem.* 2003, 384, 1265-1272.
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## 9 – Patents / Patente

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- M. Schweiger, M. Romauch, R. Zimmermann, N. Mayer, E. Fuchs, **R. Breinbauer**. 2014. Lipase inhibitors. WO2014114649 A1
- P. J. L. M. Quaedflieg, T. Nuijens, G. Strohmeier, **R. Breinbauer**, H. Schroeder. 2013. Enzymatic peptide synthesis. WO 2013135786 A1
- H. Waldmann, M. Köhn, **R. Breinbauer**, D. Nüsse, E. Voges. 2007. Entwicklung einer ortsspezifischen, chemoselektiven, und gerichteten photochemischen Mikrostrukturierungstechnik für bio- und materialwissenschaftlichen Anwendungen [z.B. zur Herstellung von Mikroarrays]. DE 102005032038A1

## 10 – Selected oral presentations (invited only) / ausgewählte Vorträge (nur Einladungen)

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- “Synthesis of Tool Compounds for the Investigation of Lipid Metabolism and Biosynthetic Pathways”. EMBO Conference – Chemical Biology, Heidelberg (Germany). August 2014
- “Synthesis of Tool Compounds for Target Identification and Target Validation”. DECHEMA - 8th Status Seminar Chemical Biology, Frankfurt (Germany). January 2013
- “Synthesis of Tool Compounds in Chemical Biology”. 15th International Conference, ISCBC, Rajkot (India). February 2011
- “The Tale of Two Enantiomers – Synthesis of Tool Compounds for Chemical Biology”. Gordon Research Conference “High Throughput Chemistry and Chemical Biology”, Les Diablerets (Switzerland). June 2010
- „ Synthesis of Heterocyclic Tool Compounds for Chemical Biology“. 13th Blue Danube Symposium on Heterocyclic Chemistry, Bled (Slovenia). Sept. 2009
- „Electrons as a Reagent in Solid Phase Organic Synthesis“. 2nd International Symposium on Organic Electron Transfer Chemistry, Yokohama (Japan). January 2007
- „New Methods for Ligation and Immobilization of Peptides and Proteins“. 1st European Chemistry Congress (EUCHEMS), Budapest (Hungary). August 2006