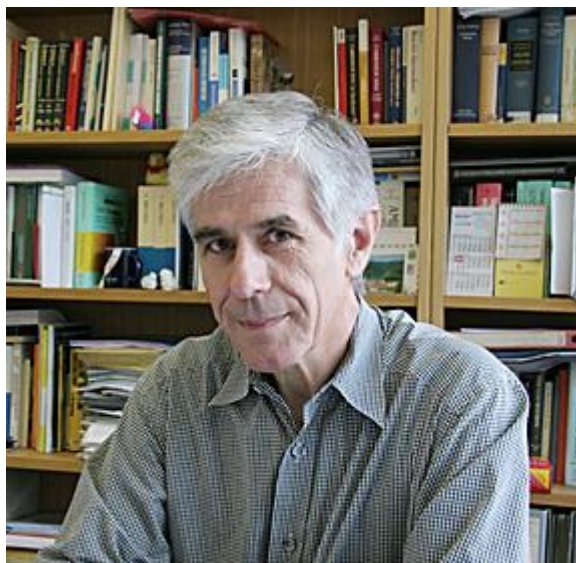


Professor Heinz Heimgartner

A Tribute



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Heinz Heimgartner was born in Münsterlingen (Switzerland) on the 5th of May 1941. After high-school graduation, he enrolled in Chemistry at the University of Zürich in 1963. He obtained his diploma in 1968 in the Department of Organic Chemistry, working under the guidance of Professor Hans Schmid on “The C-Anomalous Claisen-Rearrangement”. Between 1968 and 1972, he worked in the group of Professor Schmid toward his PhD degree in “Photochemical and Thermal Aromatic Sigmatropic Rearrangements in Hydrocarbons”. He stayed on in Zürich and supervised the research teams, “Reaction Mechanisms” and “Photochemistry” in the group of Professor Schmid from 1973 until 1976 while preparing his Habilitation. The unexpected death of Professor Schmid in 1976 was a considerable challenge in Heinz Heimgartner’s career. Between 1976 and 1979, he took over the entire responsibility for the PhD students of the mechanistic and photochemical research groups. In parallel, he was finishing his Habilitation with the title “3-Amino-2*H*-azirines, New Synthons for Heterocyclic Compounds”. In 1980, he was granted tenure and from thereon he led his own independent research group. In 1987, he was named “Titular Professor of Organic Chemistry”, and in 1995 he was promoted to Associate Professor, a position he kept until his retirement in 2006.

Heinz Heimgartner has been extraordinarily loyal to the Department of Organic Chemistry at the University of Zürich. During his entire career he was a dedicated and gifted teacher. For many years he was responsible for teaching organic chemistry to the pre-medical students at Zürich. Managing huge classes of pre-medical students is a considerable challenge, and Heinz assumed it willingly. He did a phenomenal service to the chemistry community at the University in assuming this task. He did not only accumulate an enormous number of service teaching hours, he always kept an active interest in teaching advanced courses on photochemistry and reaction mechanisms. His scientific knowledge, his didactic qualities and his dedication was recognized and appreciated by students at all levels. It is therefore no

surprise that Heinz Heimgartner has been able to attract many highly gifted and motivated students to join his group. Heinz Heimgartner represented his Department on many committees within the University and also outside of the University. He was always an excellent ambassador of his institution. His sense of duty and his human qualities were widely recognized. He was a member of the Committee of the Senate from 1982 to 1986, and a member of the 'Hochschulkommission' (board of the University) from 1985 to 1989. From 1995 until his retirement he was the Faculty delegate on the Curriculum Committee for studies in Medicine and Veterinary Medicine, and, not the smallest of all tasks, he was the 'Studienberater' (contact person for the chemistry students) from 1980 until 1995.

Heinz Heimgartner started his scientific career studying the anomalous Claisen rearrangement. During his PhD, he investigated photochemical and thermal aromatic sigmatropic rearrangements. The disclosure of what has become known as the Woodward-Hoffmann rules opened the door to a coherent understanding and classification of many unusual reactions, which previously had not been accessible to mechanistic analysis. The study of organic reaction mechanisms blossomed, and the group led by Heinz Heimgartner under the guidance of Professor Schmid in Zürich was making many important contributions to this emerging field. Heinz Heimgartner maintained a keen interest in reaction mechanisms during his entire scientific career. He accumulated a profound knowledge in this field, which allowed him to propel his research interests and to analyze the resulting data with precision.

The scientific career of Heinz Heimgartner started with a strong focus on mechanistic organic chemistry. His science concentrated on studies of unusual sigmatropic rearrangements, either thermally or photochemically induced. He soon became fascinated by a small strained heterocycle, 2*H*-azirine. The ring strain and the enhanced reactivity of this heterocyclic building block opened the door to many different transformations. An analog, the 3-dimethylamino-2*H*-azirine, proved to be even more interesting than the parent system. Many reaction cascades were observed by the Heimgartner group using these small heterocycles. The wealth of results derived from these seemingly simple starting materials is really astounding. In parallel to these studies, Heinz Heimgartner devoted part of his scientific work to studies of different cycloaddition reactions, particularly 1,3-dipolar cycloaddition. One of the recurring research themes in the Heimgartner group was the use of sulfur and selenium derivatives. Introducing these special heteroatoms into cumulenes or into heteroaromatic rings conferred a unique reactivity on these systems and often led to the formation of unexpected products. An important discovery of the Heimgartner group was a general approach to α,α -disubstituted α -amino acids using the azirine/oxazolone methodology. These methods allowed the rapid synthesis of peptides containing α,α -disubstituted α -amino acid building blocks and the study of the influence of their substitution pattern on conformation. Using the methodology developed in his group, a series of natural peptide segments and cyclic peptides were synthesized in Zürich. His collaboration with F. Hoffmann-La Roche, where he served as a consultant for 25 years, certainly contributed to his interest in peptide synthesis and structure. In parallel to this biologically oriented research, Heinz Heimgartner studied the fascinating chemistry offered by the presence of thioketones and sulfur-containing heterocycles like the 1,3-thiazolo-5(4*H*)-thiones. Using isoselenocyanates as starting materials, many unusual selenium-containing heterocycles were obtained and characterized. This research covered a wide range of chemical

reactivity, and his group always carefully characterized the resulting products and systematically analyzed the amazing reactivity induced into the small building blocks by a combination of strain, dense array of functional groups, and often the presence of unusual heteroatoms. Even though, over the years, the frequency of his published photochemical transformations diminished, Heinz Heimgartner kept up his interest and insights in this field of chemistry.

The quality of the scientific results of the Heimgartner group is largely due to the positive atmosphere and strong commitment of his collaborators. His personality and his relentless efforts for his science set an example to his group. Heinz Heimgartner made sure that all the results reported by his coworkers were up to his high standards. He taught his collaborators how to be well organized and how to consider all data in validating theories. A total of 46 PhD students, 34 diploma students and 12 postdocs have over the years spent an important part of their career under the supervision of Heinz Heimgartner. On his daily tours through the laboratory, he gave both practical advice and discussed general scientific subjects with individual students, and, unlike in many other research groups, his students welcomed these interactions and always felt invigorated in their experimental work by his collegial comments. Group meetings were professionally organized, and frequently became the focal points of new research directions and intra- and inter-group collaborations. Often, his students would share the excitement of a new reaction product, or an interesting unexpected discovery during these meetings, and genuine passion for science filled the room. Even after graduation and departure, Heinz Heimgartner kept a keen eye on the professional development of the former members of his group, and now, as ever, his students like to return for a visit and continue to consider him both a scholarly mentor as well as an exceptionally fair and empathic human being.

The list of publication of the Heimgartner lab contains more than 400 original papers published in peer reviewed journals. Since the beginning of his career and despite the many additional “distractions” imposed on him in teaching and in administration, Heinz Heimgartner has kept up an impressive output. Applying all criteria that have become so popular these days, Heinz Heimgartner contributed considerably to the reputation and the impact of the University of Zürich. His papers have been cited almost 5,700 times, and his impact still increases. Even more impressive is how many contributions of Heinz Heimgartner and his collaborators are highly cited. Heinz Heimgartner did not make his impact based on one single paper, but on the breadth of his science and based on the high reliability that characterizes his publications. He is the author of 30 reviews and minireviews. Some of these papers have become standards in their field, such as his review article on the “3-Amino-2H-azirines as synthons for α,α -disubstituted α -amino acids in heterocycle and peptide synthesis” in *Angewandte Chemie*. Professor Heinz Heimgartner has been an invited speaker at many international conferences and symposia. He lectured at more than 55 international conferences and 60 Universities and academic institutes throughout Europe. Heinz Heimgartner served many years as a senior editor of *Helvetica Chimica Acta*. He is a member of the editorial boards of a number of journals, including *Heterocycles*, *Journal of Sulfur Chemistry*, *Letters in Organic Chemistry* and *Arkivoc*.

Professor Heinz Heimgartner has been honored for his fundamental contributions to mechanistic and heterocyclic chemistry. In 1978, he received the Alfred-Werner Medal of the Swiss Chemical Society. Over the years he received several awards from the University of

Lodz and the Polish Ministry of Education. In 2002 he became a Honorary Member of the Polish Chemical Society. He is the recipient of the 2005 Kametani Award for Outstanding Research in Heterocyclic Chemistry and Contributions to Heterocycles. The Award honors the memory of the founder of *Heterocycles* and is sponsored by The Japan Institute of Heterocyclic Chemistry and Elsevier. Heinz Heimgartner received a Honorary Doctorate degree in 2009 from the University of Lodz, Poland, and in 2010 a Honorary Professor Degree from the State University of St. Petersburg, Russia. He has maintained strong scientific contacts with colleagues in Poland, Russia and Bulgaria. He contributed significantly to the integration of chemists from these countries into the science community in the years after the fall of the iron curtain.

This commemorative issue features the contributions of many friends and former collaborators of Heinz Heimgartner. It gives testimony to the respect and friendship that we all have for Heinz and his lasting commitment to chemistry and chemical education.

Professor Reinhard Neier
Department of Chemistry
University of Neuchâtel

Professor Peter Wipf
Department of Chemistry
University of Pittsburgh

Selected Papers of Professor Heinz Heimgartner

1. Obrecht, D.; Spiegler, C.; Schönholzer, P.; Müller, K.; Heimgartner, H.; Stierli, F. A New General Approach to Enantiomerically Pure Cyclic and Open-chain (*R*)- and (*S*)- α , α -Disubstituted α -Amino Acids, *Helv. Chim. Acta* **1992**, *75*, 1666.
2. Dietliker, K.; Heimgartner, H. Photochemisch induzierte Reaktionen von 3-Amino-2*H*-azirinen, *Helv. Chim. Acta* **1983**, *66*, 262.
3. Wipf, P.; Heimgartner, H. Kupplung von Peptiden mit C-terminalen α , α -disubstituierten α -Aminosäuren via Oxazol-5(4*H*)-one, *Helv. Chim. Acta* **1986**, *69*, 1153.
4. Gilgen, P.; Heimgartner, H.; Schmid, H. Photoinduzierte 1,3-dipolare Cycloadditionen von 3-Phenyl-2*H*-azirinen an Azodicarbonsäure-diätylester, *Helv. Chim. Acta* **1974**, *57*, 1382.
5. Vittorelli, P.; Heimgartner, H.; Schmid, H.; Hoet, P.; Ghosez, L. Addition of Carboxylic Acids and Cyclic 1,3-Diketones to 2-Dimethylamino-3,3-dimethyl-1-azirine, *Tetrahedron* **1974**, *30*, 3737.
6. Heimgartner, H.; Ulrich, L.; Hansen, H. J.; Schmid, H. Photochemisches Verhalten von 1- und 2-alkylierten 1,2-Dihydrionaphthalinen, *Helv. Chim. Acta* **1971**, *54*, 2313.
7. Märky, M.; Meier, H.; Wunderli, A.; Heimgartner, H.; Schmid, H.; Hansen, H. J. Zum photochemischen Verhalten von Sydnonen und 1,3,4-Oxadiazolin-5-onen, *Helv. Chim. Acta* **1978**, *61*, 1477.
8. Wipf, P.; Heimgartner, H. Synthesis of Peptides Containing α , α -Disubstituted α -Amino Acids by the Azirine/Oxazolone Method. The (12-20)-Nonapeptide of the Ionophore Alamethicin, *Helv. Chim. Acta* **1990**, *73*, 13.

9. Giezendanner, H.; Heimgartner, H.; Jackson, B.; Winkler, T.; Hansen, H. J.; Schmid, H. Photochemische Cycloadditionen von 3-Phenyl-2*H*-azirinen mit Aldehyden, *Helv. Chim. Acta* **1973**, *56*, 2611.
10. Orahovats, A.; Heimgartner, H.; Schmid, H.; Heinzelmann, W. Photochemische Erzeugung und Reaktionen des Benzonitril-benzylids, *Helv. Chim. Acta* **1975**, *58*, 2662.
11. Jenny, Ch.; Heimgartner, H. Synthese von 4,4-disubstituierten 1,3-Thiazol-5(4*H*)-thionen, *Helv. Chim. Acta* **1986**, *69*, 374.
12. Chaloupka, S.; Heimgartner, H.; Schmid, H.; Link, H.; Schönholzer, P.; Bernauer, K. Herstellung und Reaktion der valenzpolaromeren Verbindung (4,4-Dimethyl-2-thiazolin-5-dimethyliminium)-2-thiolat – 1-(Dimethyl-thiocarbonyl)-1-methyläthylisothiocyanat aus 2,2-Dimethyl-3-dimethylamino-2*H*-azirin und Schwefelkohlenstoff, *Helv. Chim. Acta* **1976**, *59*, 2566.
13. Chaloupka, S.; Vittorelli, P.; Heimgartner, H.; Schmid, H.; Link, H.; Bernauer, K.; Oberhänsli, W.E. Synthese und Reaktionen 8-gliedriger Heterocyclen aus 3-Dimethylamino-2,2-dimethyl-2*H*-azirin und Saccharin bzw. Phthalimid, *Helv. Chim. Acta* **1977**, *60*, 2476.
14. Strässler, C.; Linden, A.; Heimgartner, H. Novel Heterospirocyclic 3-Amino-2*H*-azirines as Synthons for Heterocyclic α -Amino Acids, *Helv. Chim. Acta* **1997**, *80*, 1528.
15. Narasimhan, N.S.; Heimgartner, H.; Hansen, H.J.; Schmid, H. Thermische Reaktionen mit 3-Phenyl-2*H*-azirinen; 1,3-dipolare Cycloadditionen und En-Reaktionen *Helv. Chim. Acta* **1973**, *56*, 1351.
16. Bucher, C. B.; Heimgartner, H. Optisch aktive 3-Amino-2*H*-azirine als Bausteine für enantiomerenreine α , α -disubstituierte α -Aminosäuren: Synthese von Isovalin-Synthonen und Einbau in ein Trichotoxin-A-50-Segment *Helv. Chim. Acta* **1996**, *79*, 1903.
17. Mloston, G.; Heimgartner, H. Bildung von 1,2,4-Trithiolanen in Dreikomponenten-Gemischen aus Phenyl-azid, aromatischen Thioketonen und 2,2,4,4-Tetramethylcyclobutanthionen: Eine Schwefel-Transfer-Reaktion unter Bildung von 'Thiocarbonyl-thiolaten' ((Alkyliden-sulfonio)thiolaten) als reaktive Zwischenstufen *Helv. Chim. Acta* **1995**, *78*, 1298.
18. Gakis, N.; Märky, M.; Hansen, H. J.; Heimgartner, H.; Schmid, H.; Oberhänsli, W.E. Photochemische Synthese von 4-Phenyl-3-oxazolin-5-onen und deren thermische Dimerisierung, *Helv. Chim. Acta* **1976**, *59*, 2149.
19. Luykx, R.; Bucher, C. B.; Linden, A.; Heimgartner, H. Ein neues 3-Amino-2*H*-azirin als Aib-Pro-Baustein: Synthese des C-terminalen Nonapeptids von Trichovirin I 1B, *Helv. Chim. Acta* **1996**, *79*, 527.
20. Kägi, M.; Linden, A.; Heimgartner, H.; Mloston, G. Umsetzung von 1,3-Thiazol-5(4*H*)-thionen mit Diazomethan, *Helv. Chim. Acta* **1993**, *76*, 1715.
21. Wipf, P.; Heimgartner, H. Konformationsanalysen von Modell-Tripeptiden: Der Einfluss von α , α -disubstituierten α -Aminosäuren auf die Sekundärstruktur. Teil I: NMR- und CD-Untersuchungen, *Helv. Chim. Acta* **1988**, *71*, 258.
22. Lehmann, J.; Linden, A.; Heimgartner, H. Site-Selective Incorporation of Thioamide-Linkages into a Growing Peptide, *Tetrahedron* **1999**, *55*, 5359.

23. Mloston, G.; Romanski, J.; Linden, A.; Heimgartner, H. Thiocarbonyl-imide aus der Umsetzung von 2,2,4,4-Tetramethyl-3-thioxocyclobutanon mit Aryl-aziden, *Helv. Chim. Acta* **1993**, *76*, 2147.
24. Mloston, G.; Linden, A.; Heimgartner, H. Regioselektive 1,3-dipolare Cycloadditionen von Thiocarbonyl-Yliden mit 1,3-Thiazol-5(4*H*)-thionen, *Helv. Chim. Acta* **1991**, *74*, 1386.
25. Chandrasekhar, B. P.; Schmid, U.; Schmid, R.; Heimgartner, H.; Schmid, H. Additionen von 2,2-Dimethyl-3-dimethylamino-2*H*-azirin an 2-Formyl-cycloalkanone und Sulfinsäuren, *Helv. Chim. Acta* **1975**, *58*, 1191.
26. Zhou, Y.; Linden, A.; Heimgartner, H. Selenium-Containing Heterocycles from Isoselenocyanates: Synthesis of 1,3-Selenazoles from Phenylimidoyl Isoselenocyanates, *Helv. Chim. Acta* **2000**, *83*, 1576.
27. Bucher, C. B.; Linden, A.; Heimgartner, H. Optisch aktive 3-Amino-2*H*-azirine als Bausteine für enantiomerenreine α , α -disubstituierte α -Aminosäuren: Synthese des α -Methylphenylalanin-Synthons und Einbau in Modell-Peptide, *Helv. Chim. Acta* **1995**, *78*, 935.
28. Obrecht, D.; Prewo, R.; Bieri, J. H.; Heimgartner, H. 1,3-Dipolare Cycloadditionen von Benzonitrilio-2-propanid mit 4,4-Dimethyl-2-phenyl-2-thiazolin-5-thion und Schwefelkohlenstoff, *Helv. Chim. Acta* **1982**, *65*, 1825.
29. Meier, H.; Heinzelmann, W.; Heimgartner, H. Direkter Nachweis von Diphenylnitrilimin bei der Photolyse von 2,5-Diphenyltetrazol, *Chimia* **1980**, *34*, 504.
30. Kägi, M.; Linden, A.; Mloston, G.; Heimgartner, H. 1,5-Dipolare Elektrocyclisierung von Acyl-substituierten 'Thiocarbonyl-yliden' zu 1,3-Oxathiolen, *Helv. Chim. Acta* **1996**, *79*, 855.
31. Mloston, G.; Petit, M.; Linden, A.; Heimgartner, H. Umsetzung von Di(*tert*-butyl)- und Diphenyldiazomethan mit 1,3-Thiazol-5(4*H*)-thionen: Isolierung und Kristallstruktur des primären Cycloadduktes, *Helv. Chim. Acta* **1994**, *77*, 435.
32. Kägi, M.; Mloston, G.; Linden, A.; Heimgartner, H. Umsetzung von Diazoessigsäure-ethylester mit 1,3-Thiazol-5(4*H*)-thionen, *Helv. Chim. Acta* **1994**, *77*, 1299.
33. Dietliker, K.; Gilgen, P.; Heimgartner, H.; Schmid, H. Photochemie von in Stellung 4 substituierten 5-Methyl-3-phenyl-isoxazolen, *Helv. Chim. Acta* **1976**, *59*, 2074.
34. Heimgartner, H.; Zsindely, J.; Hansen, H.-J.; Schmid, H. Die Dienol-Benzol-Umlagerung von Propargylcyclohexadienolen; aromatische [1,2]-, [3,3]- und [3,4]-sigmatropische Umlagerungen, *Helv. Chim. Acta* **1972**, *55*, 1113.
35. Obrecht, D.; Heimgartner, H. 3-(Dimethylamino)-2,2-dimethyl-2*H*-azirin als α -Aminoisobuttersäure (Aib)-Äquivalent: Cyclische Depsipeptide durch direkte Amidcyclisierung, *Helv. Chim. Acta* **1987**, *70*, 329.
36. Wipf, P.; Heimgartner, H. Selektive Amdispaltung bei Peptiden mit α , α -disubstituierten α -Aminosäuren, *Helv. Chim. Acta* **1987**, *70*, 354.
37. Obrecht, D.; Heimgartner, H. Synthese eines cyclischen Depsipeptides mittels Amidcyclisierung, *Helv. Chim. Acta* **1984**, *67*, 526.
38. Nakamura, Y.; Bachmann, K.; Heimgartner, H.; Schmid, H.; Daly, J. J. Stickstoffhaltige Dieisen-hexacarbonyl-Komplexe aus 3-Phenyl-2*H*-azirinen, *Helv. Chim. Acta* **1978**, *61*, 589.

39. Chandrasekhar, B. P.; Heimgartner, H.; Schmid, H. Reaktionen von 3-Dimethylamino-2,2-dimethyl-2*H*-azirin mit Phenolen und Halogenaromaten, *Helv. Chim. Acta* **1977**, *60*, 2270.
40. Heimgartner, H.; Hansen, H.-J.; Schmid, H. Thermisches Verhalten von 1,2-Dipropenylbenzolen, *Helv. Chim. Acta* **1972**, *55*, 1385.
41. Lehmann, J.; Linden, A.; Heimgartner, H. Synthesis of the Endothiopeptide BOC-Trp-Ile-Ala-Aib-Ile-Val ψ [CSNH]Aib-Leu-Aib-Pro-OMe by a Variation of the 'Azirine/Oxazolone Method', *Tetrahedron* **1998**, *54*, 8721.
42. Wipf, P.; Heimgartner, H. Anwendung der Azirin/Oxazolone-Methode in der Peptid-Chemie: Synthese von Modell-Tripeptiden, *Helv. Chim. Acta* **1988**, *71*, 140.
43. Petit, M.; Linden, A.; Mloston, G.; Heimgartner, H. Reaktion von Phenyl diazomethan mit 1,3-Thiazol-5(4*H*)-thionen: Basenkatalysierte Ring-Öffnung des Primäradduktes, *Helv. Chim. Acta* **1994**, *77*, 1076.
44. Schulze, B.; Kirsten, G.; Kirrbach, S.; Rahm, A.; Heimgartner, H. Zur Oxidation von 1,2-Thiazolen: Ein einfacher Zugang zu 1,2-Thiazol-3(2*H*)-on-1,1-dioxiden, *Helv. Chim. Acta* **1991**, *74*, 1059.
45. Obrecht, D.; Heimgartner, H. 3-(Dimethylamino)-2,2-dimethyl-2*H*-azirin als Aib-Äquivalent: Synthese von Aib-Oligopeptiden, *Helv. Chim. Acta* **1987**, *70*, 102.
46. Bruhn, J.; Heimgartner, H.; Schmid, H. Die Cope-Umlagerung als Prinzip einer repetierbaren Ringerweiterung, *Helv. Chim. Acta* **1979**, *62*, 2630.
47. Scholl, B.; Bieri, J.; Heimgartner, H. 1,5,6,7-Tetrahydro-2*H*-[1,4]diazepin-5,7-dione aus malonimiden und 3-Dimethylamino-2,2-dimethyl-2*H*-azirin, *Helv. Chim. Acta* **1978**, *61*, 3050.
48. Zhou, Y.; Heimgartner, H. Selenium-Containing Heterocycles from Isoselenocyanates: Synthesis of 1,2,3-Selenadiazole Derivatives, *Helv. Chim. Acta* **2000**, *83*, 539.
49. Koch, K. N.; Linden, A.; Heimgartner, H. Synthesis of 16-Membered Cyclic Depsipeptides via Direct Amide Cyclization, *Helv. Chim. Acta* **2000**, *83*, 233.
50. Meier, H.; Heimgartner, H.; Schmid, H. Thermische und photochemisch induzierte intramolekulare 1,3-dipolare Cycloadditionen von 4-Phenyl-3-(2-allylphenyl)sydnon, *Helv. Chim. Acta* **1977**, *60*, 1087.
51. Wipf, P.; Kunz, R. W.; Prewo, R.; Heimgartner, H. Konformationsanalysen von Modell-Tripeptiden: Der Einfluss von α , α -disubstituierten α -Aminosäuren auf die Sekundärstruktur. Teil II: Röntgenstrukturanalyse und Konformationsenergie-Berechnungen, *Helv. Chim. Acta* **1988**, *71*, 268.
52. Jeremic, T.; Linden, A.; Moehle, K.; Heimgartner, H. Synthesis and Conformational Analysis of 18-Membered Aib-containing Cyclohexapeptides, *Tetrahedron* **2005**, *61*, 1871.
53. Pradeille, N.; Zerbe, O.; Möhle, K.; Linden, A.; Heimgartner, H. The First Total Synthesis of the Peptaibol *Hypomurocin A1* and Its Conformation Analysis: an Application of the 'Azirine/Oxazolone Method', *Chem. Biodivers.* **2005**, *2*, 1127.
54. Köttgen, P.; Linden, A.; Heimgartner, H. Synthesis of Enniatin-like Cyclic Depsipeptides via 'Direct Amide Cyclization', *Helv. Chim. Acta* **2006**, *89*, 731.
55. Atanassov, P. K.; Linden, A.; Heimgartner, H. Derivatives from Isoselenocyanates: Synthesis of 2-Phenyl-6*H*-[5,1,3]benzoselenadiazocine, *Helv. Chim. Acta* **2004**, *87*, 1452.

56. Sommen, G. L.; Linden, A.; Heimgartner, H. Selenium-Containing Heterocycles From Isoselenocyanates: Synthesis of 1,3-Selenazolidine and Perhydro-1,3-selenazine Derivatives, *Eur. J. Org. Chem.* **2005**, 3128.
57. Majchrzak, A.; Mloston, G.; Linden, A.; Heimgartner, H. Reactions of Sulfonyl Chlorides with Thiocamphor and Thiofenchone: *Wagner-Meerwein* Rearrangement of an Intermediate Thiocarbonylium Ion, *Helv. Chim. Acta* **2004**, *87*, 790.
58. Iliev, B.; Linden, A.; Kunz, R.; Heimgartner, H. 14-Membered cyclodepsipeptides with alternating β -hydroxy and α -amino acids by cyclodimerization, *Tetrahedron* **2006**, *62*, 1079.
59. Fedorov, A.; Fu, C.; Linden, A.; Heimgartner, H. Reaction of Thioketones with (*R*)-2-Vinyloxirane: Regio- and Stereoselective Formation of (*S*)-4-Vinyl-1,3-oxathiolanes, *Eur. J. Org. Chem.* **2005**, 1613.
60. Dannecker-Dörig, I.; Linden, A.; Heimgartner, H. Synthesis of Aib-containing cyclopeptides via the 'azirine/oxazolone method', *Coll. Czech. Chem. Commun.* **2009**, *74*, 901.
61. Fritschi, S. P.; Linden, A.; Heimgartner, H. Synthesis of Macrocyclic Lactams from 2-(ω -Aminoalkyl)-2-benzoylamino-3-phenyl-*N,N*-dimethylpropanamides via Direct Amide Cyclization, *Heterocycles* **2009**, *79*, 985.
62. Altherr, W.; Linden, A.; Heimgartner, H. The 'Azirine/Oxazolone Method' in Peptaibol Synthesis: Preparation of a Derivative of Trichotoxin A-50 (G), *Chem. Biodivers.* **2007**, *4*, 1144.
63. Egli, D. H.; Linden, A.; Heimgartner, H. 1,5-Dipolar Electrocyclizations in Reactions of α -Thioxo Ketones and α -Thioxo Thioamides with Diazo Compounds, *Helv. Chim. Acta* **2006**, *89*, 1910-1926.
64. Budzowski, A.; Linden, A.; Heimgartner, H. The 'Azirine/Oxazolone Approach' to the Synthesis of Aib-Pro Endothiopeptides, *Helv. Chim. Acta* **2008**, *91*, 1471.
65. Brun, K. A.; Linden, A.; Heimgartner, H. Synthesis and Conformational Analysis of Pentapeptides Containing Enantiomerically Pure 2,2-Disubstituted Glycines, *Helv. Chim. Acta* **2008**, *91*, 526.
66. Stamm, S.; Heimgartner, H. Introduction of the Aib-Pro unit into peptides by means of the 'azirine/oxazolone method' on solid phase, *Tetrahedron* **2006**, *62*, 9671.
67. Nikolaev, V. V.; Heimgartner, H.; Linden, A.; Krylov, I. S.; Nikolaev, V. A. Rh^{II}-Catalyzed Reactions of Diazocarbonyl Compounds with Dicarboximides, *Eur. J. Org. Chem.* **2006**, 4737.
68. Mekhael, M. K. G.; Heimgartner, H. A Novel Synthetic Approach to (\pm)-Desoxynoreseroline, *Helv. Chim. Acta* **2003**, *86*, 2805.
69. Gebert, A.; Heimgartner, H. Synthesis of an Enantiomerically Pure 1,3-Thiazole-5(4*H*)-thione and Its Stereoselective 1,3-Dipolar Cycloaddition with an Azomethine Ylide, *Helv. Chim. Acta* **2002**, *85*, 2073.
70. Blagoev, M.; Linden, A.; Heimgartner, H. Stereochemical Course of the Reaction between Thiocarbonyl Compounds and Oxiranes: Reaction with *cis*- and *trans*-2,3-Dimethyloxirane, *Helv. Chim. Acta* **2000**, *83*, 3163.

71. Suter, G.; Stoykova, S. A.; Linden, A.; Heimgartner, H. Heterospirocyclic *N*-(2*H*-Azirin-3-yl)-L-prolinates: New Dipeptide Synthons, *Helv. Chim. Acta* **2000**, *83*, 2961.
72. Garcia Trimino, M. I.; Mañas Cabrera, A.; Vélez Castro, H.; Rosado Pérez, A.; Moya Argilagos, D.; Linden, A.; Heimgartner, H. Reaction of *N,N'*-Dimethyl-2-nitroethene-1,1-diamine with α,β -Unsaturated Acyl Isothiocyanates: Preparation of 1,3-Thiazin-4-one and 4-Nitro-1,2-thiazol-5(2*H*)-imine Derivatives, *Helv. Chim. Acta* **1998**, *81*, 718.
73. Mihova, T. R.; Linden, A.; Heimgartner, H. Ring Enlargement of Eight- and Nine-Membered Cyclic Sulfonamide Derivatives in Reactions with 3-Amino-2*H*-azirines, *Heterocycles* **1998**, *49*, 215.
74. Bojkova, N.; Heimgartner, H. 1,3-Dipolar Cycloadditions with 1-Alkoxy-substituted Nitrile Ylides, *Heterocycles* **1998**, *47*, 781.
75. Ametamey, S. M.; Hollenstein, R.; Heimgartner, H. ¹⁵N-Markiertes 3-(Dimethylamino)-2,2-dimethyl-2*H*-azirin zur mechanistischen Untersuchung von Reaktionen mit NH-aciden Heterocyclen, *Helv. Chim. Acta* **1988**, *71*, 521.
76. Schläpfer-Dähler, M.; Heimgartner, H. Ring-Transformationen bei der Umsetzung von 3-(Dimethylamino)-2,2-dimethyl-2*H*-azirin mit 1-substituierten Imidazolidin-2,4,5-trionen, *Helv. Chim. Acta* **1993**, *76*, 2321.
77. Magirius, F.; Linden, A.; Heimgartner, H. Umsetzungen von 3-Amino-2*H*-azirinen mit Salicylohydrazid, *Helv. Chim. Acta* **1993**, *76*, 1980.
78. Arnhold, F.; Chaloupka, S.; Linden, A.; Heimgartner, H. Bortrifluorid-katalysierte Umsetzung von 3-Amino-2*H*-azirinen mit Amidien: Bildung von 4,4-disubstituierten 4*H*-Imidazolen, *Helv. Chim. Acta* **1995**, *78*, 899.
79. Shi, J.; Heimgartner, H. New Addition Reactions of Organometal Compounds with 4,4-Dimethyl-1,3-thiazole-5(4*H*)-thiones, *Helv. Chim. Acta* **1996**, *79*, 371.
80. Tromm, P. C.; Heimgartner, H. Eine neue 1,3-Oxathiolan-Synthese: Spirocyclische 1,3-Oxathiolane aus der *Lewis*-Säure katalysierten Umsetzung von 1,3-Thiazol-5(4*H*)-thionen mit Oxiranen, *Helv. Chim. Acta* **1990**, *73*, 2287.
81. Villalgorido, J. M.; Heimgartner, H. Synthesis of a Novel Heterospirocyclic 3-(*N*-Methyl-*N*-phenylamino)-2*H*-azirine and its Use as an Amino Acid Equivalent in the Preparation of a Model Tripeptide, *Tetrahedron* **1993**, *49*, 7215.
82. Hugener, M.; Heimgartner, H. 4-Amino-1,5-dihydro-2*H*-pyrrol-2-one aus Bortrifluorid-katalysierten Umsetzungen von 3-Amino-3*H*-azirinen mit Carbonsäure-Derivaten, *Helv. Chim. Acta* **1995**, *78*, 1490.