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Chemistry at the Haute Ecole Valaisanne: Recent Developments in the Analytical Field

Urban Frey* and Jean-Luc Luisier

Abstract: The major activities of our competence centre 'Process engineering', which groups together the two fields of study, Chemistry and Food & Biotechnology, are applied research and development (aR&D) as well as technology transfer. Two years ago the analytical orientation of the Chemistry Department was reinforced in Sion (see *Chimia* **2000**, *54*, 258).

We would like to present two recent developments at our competence centre. The first one deals with a quality control method for wine corks which reduces the risk of altering the wine by the unwanted flavour of musty taint, commonly called 'cork taint'. The goal of this development was to set up a sensitive and selective analytical method at the ppt level for chloroanisoles that is sufficiently cheap and rapid for routine tests. The second item presented here is the development of an instrument for fast analysis of the global volatile contents (TV9000).

Keywords: Analytics · Chloroanisoles · Electronic nose · GC-MSMS · Volatiles

Quality Control of Wine Corks: A Tricky Analytical Problem

The quality testing of wine corks should ensure a good sealing of the wine bottles for years without altering the wine, especially avoiding unwanted flavours. Different physical and chemical tests, such as dimensions, extraction force, migration, absence of residual oxidants and moisture, are currently used in the routine quality control of cork stoppers. However, much less is undertaken to track the musty taint, also called 'cork taint', even if the potential of the damage is estimated to about 1 G$ worldwide. The principal causative agents for this disagreeable flavour are chloroanisoles at trace levels: 2,4,6-trichloroanisole (TCA) and 2,3,4,6-tetrachloroanisole (TeCA). In fact, TCA has an olfactory detection limit as low as 5 ppt in white wine, or in other words, only a few grams could destroy the annual Swiss white wine production. Two methods are used to test these corks: i) Sensory analysis, which consists of soaking corks for 24 or 48 h in wine or water. This is a global check for unwanted flavours, but depends much on the experience of the analyst. ii) Determination of TCA in cork by methods using gas chromatography coupled either to a mass spectrometer (GC-MS) or to an electron capture detector (GC-ECD). The second method suffers from a very long (expensive) preparation, extraction and concentration time, and is therefore not used routinely.

Our approach combines the sensory analysis with a determination of TCA using a simple and fast, but still sensitive and selective, analytical method. The wine corks are soaked in white wine (chasselas type) for 24 h at room temperature. This extract is then tested by sensory analysis, where no deviations in odour and taste, others than those due to natural cork, are accepted. A sample of the extract (10 ml) is used for the determination of the chloroanisoles.

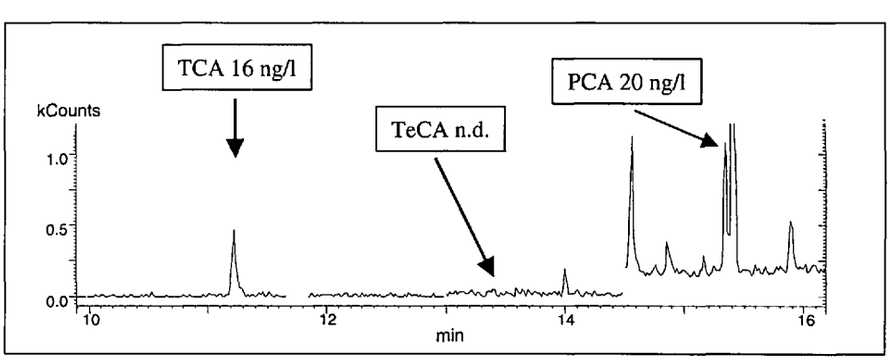

Fig. 1. GC-MSMS chromatogram (daughter ions 167, 195, 203, 231, 237, 265) obtained from a batch of wine with a non-acceptable level of TCA. n.d. = not detected.

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The method used consists in a concentration step by solid phase micro-extraction (SPME) of the headspace, followed by GC-MSMS analysis. The MSMS method is tuned for each of the chloroanisoles (TCA, TeCA and pentachloroanisole) (see Fig. 1). This mode is not only very sensitive, *i.e.* limit of detection of 1 ppt for TCA, but has in addition a very high selectivity compared to the MS-single-ion-monitoring mode or an ECD detector. The analysis takes less than 1 h and it can also be automated using the CombiPal multipurpose sample injector (Fig. 2).

In conclusion, due to the short and simple analytical set-up, the method is adapted for a fast routine quality control of wine cork batches. It will reduce the risk of altering wine by musty taint. However, one has to be aware, of the fact that wine corks are not the only source for musty taint in wine and that TCA can also be found in screw capped wine bottles.

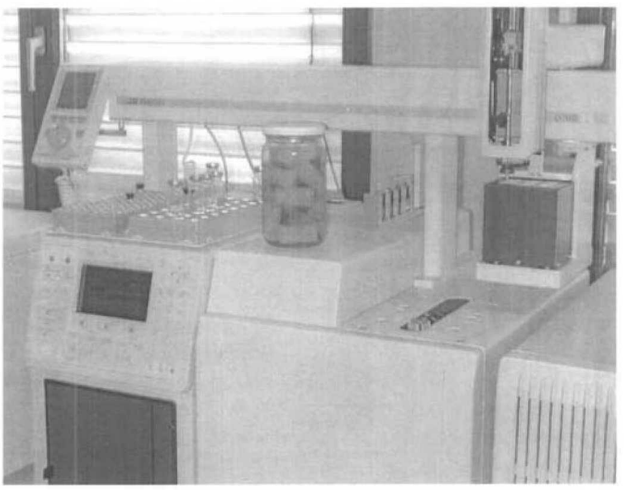

Fig. 2. Automated determination of chloroanisoles by SPME extraction and GC-MSMS analysis using the CombiPal multipurpose sample injector.

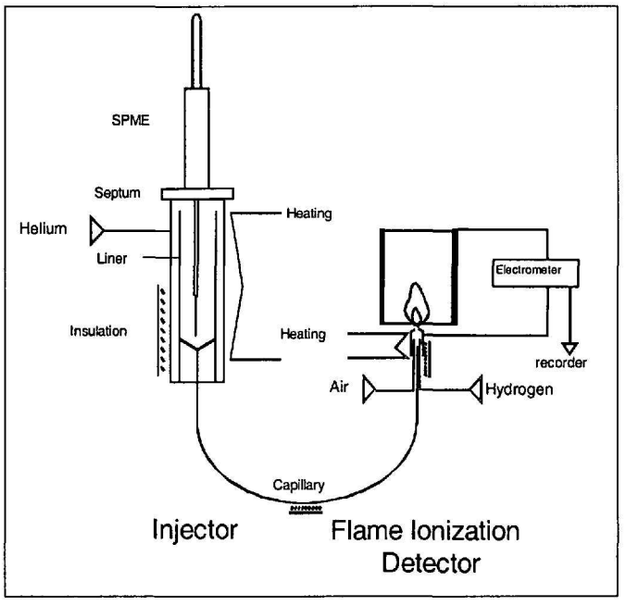

Fig. 3. Schematic drawing of the apparatus developed with Brechbühler AG.

Total Volatile Analysis: The Concept 'SION' (Smart Instrumental Objective Nose)

The need for a reliable method to measure volatile compounds is well documented by the large number of research projects on the electronic nose (e-nose). As an alternative to the e-nose, we propose a concept based on SPME with direct desorption/measurement (Fig. 3). Our method works in two steps:

1 *Adsorption* of the volatile compounds on a SPME fiber. SPME is well known in the headspace analysis, but up-to-now is always used in conjunction with a separation technique like GC or HPLC. The sampling process is short and takes from 2 to 30 min.

2 *Desorption* of the adsorbed volatile in a GC-like injector. Instead of a separating column, a short capillary transfers the substances directly to a detector. The signal, obtained with classical GC detectors (FID, NPD, ECD, MS) is a peak, whose surface is directly proportional to the total amount of the adsorbed volatiles. The desorption takes place in less than 2 min.

The headspace adsorption techniques for SPME are identical in our measurement with those used for GC applications. In the case a problem is encountered on the production line, it can be analysed in a research laboratory. This is a big difference when compared to the e-nose: the experience of the analytical laboratory can be fully transferred to the production line where a process has to be monitored, and *vice versa*.

The measurement of a global property is a current procedure in quality control, *e.g.* the quality of spices and aromatic herbs is measured by the global content of essential oil, the detection of hydrocarbons in water is done by measuring the IR or the UV absorbance of an extract, the conductivity of a solution is often used for process monitoring.

Applications developed so far:

- Measuring VOC in water
- Monitoring an enzymatic reaction: the hydrolysis of amygdalin in benzaldehyde
- Freshness of fish: a rapid measurement of TVB-N
- Measuring the essential oil content of aromatic herbs and spices.

Further development in progress: off-odours in packaging material, solvents in pharmaceuticals (Table).

As the technique is still under development, we are very interested in looking for new applications. Please contact Dr. Jean-Luc Luisier for further details.

Received: October 31, 2000

Table.

	Total Volatile Measurement TV 9000		Standard GC / GC-MS
Where	On the production line		Control lab
Who	Untrained personnel		Chemist, technical pers.
Method	FID, NPD, QMB, etc.	MS	GC, GC-MS
Result	Single peak	Global MS	Chromatogram
Interpretation	Quantityof volatiles	Like e-nose	Analysis
Time of detn.	5 min	5 min	long
Investment	low	high	very high
Personal cost	low	low	high

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SACh Section of Analytical Chemistry

SACh-WEITERBILDUNG IM JANUAR UND FEBRUAR 2001

Ins Jahr 2001 starten wir mit folgenden Veranstaltungen für fortgeschrittene Anwender:

CHROMATOGRAPHIE- UND ELEKTROPHORESEKURSE

GC 2 **Stand der Technik in GC**

Ziel
Sie sind mit den wichtigsten theoretischen Aspekten sowie mit den aktuellsten praktischen Möglichkeiten vertraut.
Referent:
Prof. Dr. Michael Oehme, Universität Basel
Ort/Termin
Zürcher Hochschule, Winterthur / 26.–28. Februar 2001

HPLC 2 **HPLC-Phasen, -Phasenwahl und -Trennoptimierung**

Ziel:
Sie verstehen die Zusammenhänge, welche die HPLC Trennung beeinflussen und können daraus Optimierungsstrategien ableiten.
Referent
Jean-Claude Hildenbrand, Novartis Services AG, Basel
Ort/Termin
Berner Fachhochschule, Burgdorf / 22.–23. Januar 2001

BA 1 **Kapillarelektrophorese (in Deutsch und in Französisch)**

Ziel
Sie kennen sowohl die apparativen Voraussetzungen als auch die Grundlagen der Kapillarelektrophorese. Dadurch sind Sie in der Lage, diese Technik für Ihre analytischen Probleme einzusetzen.
Orte/Termine
Berner Fachhochschule, Burgdorf / 26. Januar 2001
Dieser Kurs wird am 29. Januar 2001 an der Universität Genf von Prof. Dr. Jean-Luc Veuthey in Französisch durchgeführt. Verlangen Sie unsere Ausschreibung in französischer Sprache.

KURSE IN QUALITÄTSSICHERUNG UND PROJEKTMANAGEMENT

QS 2 **Messunsicherheit in der chemischen Analytik**

Ziel
Sie verstehen das Konzept der Berechnung der Messunsicherheit nach der Anleitung von EURACHEM/CITAC 'Quantifying Uncertainty in Analytical Measurement'. Sie sind in der Lage, die Messunsicherheit eines einfachen Analysenverfahrens selbständig zu berechnen.
Referenten
Dr. Veronika Meyer, EMPA, St. Gallen; Dr. Michael Weber, EMPA, St. Gallen
Ort/Termin
Fachhochschule Aargau, Brugg/Windisch/5.–6. Februar 2001

PM 3 **Projekte erfolgreich führen**

Ziel
Sie
- kennen die Anforderungen an das Führungs- und Teamverhalten in den einzelnen Projektphasen
- verfügen über Kenntnisse Ihrer eigenen, persönlichen Stärken und Schwächen
- kennen die Anforderungen an das Management von Veränderungen in der speziellen Projektsituation

Referent
Peter Corbat, Management Consulting Cockpit, Sisseln
Ort/Termin
Berner Fachhochschule, Burgdorf / 1.–2. Februar 2001

Mehr Informationen / Anmelden

⇒ **Kopieren und einsenden oder faxen an:**
Sekretariat SACh
Fachhochschule Burgdorf
Abteilung Chemie
Pestalozzistrasse 20
CH-3400 Burgdorf
034 / 426 43 91

- **Ich melde mich an für:**
  Veranst. Nr. GC 2 ❑ HPLC 2 ❑ Nr. BA 1 ❑ Nr. QS 2 ❑ Nr. PM 3 ❑
- Senden sie mir unentgeltlich die Weiterbildungsbroschüre Analytik 2000/2001 ❑

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Mathieu, Pascal, 8006 Zürich

Narkevitch, Vera, 1015 Lausanne

Patiny, Luc, Dr., 1015 Lausanne

Sahli, Stefan, 8006 Zürich

INFORMATION

News

Lonza Steps into Contract Manufacturing of Large Scale Therapeutic Peptide Production

Basel, October 17, 2000 – Following increasing demand for large-scale peptide production in a growing global peptide pharmaceutical market, Lonza enters large scale microbial peptide manufacturing, using state-of-the art fermentation and down stream processing technology. This enables Lonza to cost-effectively produce peptides of quantities greater than 100 kg.

The global peptide pharmaceutical market was estimated at $ 350 million in 1999, at the active pharmaceutical ingredient (APIs) level. Driven by recent advances in formulation technology, alternative non-parenteral delivery systems and more cost efficient API production methods, the market for therapeutic bulk peptides is expected to grow at an above average annual growth rate of over >15% and could reach between $ 800 and $ 900 million by the year 2005.

Peptides, like proteins are biologically very active molecules and target specific diseases. They are relatively fragile molecules and are often quickly inactivated by digestive enzymes in the stomach, being degraded to constituent amino acids. To achieve effective delivery of the active peptide, the drugs can be injected, applied as a slow release patch under the skin or applied topically.

Large-scale peptide manufacturing of quantities greater than 100 kg is still a highly cost-intensive endeavour, especially for long-chain peptides. Lonza's strategy is to minimize costs of a given process by maximizing throughput and minimizing assets, raw materials and solvent usage. DSP). In collaboration with The Medicines Company, Cambridge, MA, Lonza recently developed and scaled-up a new recombinant process for the production of a key peptide intermediate for the semi-synthesis of the bulk active pharmaceutical peptide, bivalirudin, a bivalent thrombin inhibitor under review by the US FDA for use in cardiovascular indications.

As one of the leading fine chemical producers, Lonza can rely on its existing infrastructure for large-scale solvent recovery and waste treatment.

Recently, Lonza has also become active in the field of chemical solid/liquid phase production and purification of therapeutic peptides at its Visp facility, further strengthening Lonza's cGMP manufacturing capabilities.

The final production method of choice depends on several factors such as the number of amino acids, complexity of the structure, development timelines, manufacturing quantities and price expectations for the bulk active substance.Lonza and its clients benefit from this synergy between a broad ranged chemistry platform and cutting-edge biotechnology.

For further information please contact:
Dr. Walter Eschenmoser
Tel.: +41 61 316 83 63
Fax: +41 61 316 82 20
E-Mail: walter.eschenmoser@lonzagroup.com

BASILEA Pharmaceutica: a New Biotech Start-Up Formed Under Roche's Leadership

Basel, October 17, 2000. Roche announced today the creation of an independent Biotech company named 'BASILEA Pharmaceutica' to discover and develop innovative drugs in the areas of infectious diseases and dermatology.

By creating BASILEA Pharmaceutica, Roche's R&D know-how and intellectual property in antibiotics, antifungals and dermatology, established over the last 15 years, will be integrated in this broadly based Biotech company well positioned to supply novel drugs for the future. In this way, Roche continues to focus its research and development resources in key strategic areas while capitalising on valuable assets to bring new products to the market outside of Roche's principal strategic focus. Roche will maintain a minority equity interest in the company and the option for global development and marketing rights to individual development candidates in return for the payment of milestones and royalties.

BASILEA Pharmaceutica's management and staff will be constituted primarily by a group of former Roche employees. The company will be based in the Basel region.

BASILEA Pharmaceutica will start with a strong portfolio comprised of five compounds entering phase I and II development, two projects in late stages of preclinical research and ten projects at the stage of lead optimisation. The company will utilise cutting-edge technologies, and the latest methods in genomics, biochemistry and biophysics, as well as combinatorial and medicinal chemistry to discover and develop new medicines. Informatics will be integrated into all processes as a major driver of efficiency in drug discovery. Natural product screening, historically a source of novel medicines for the treatment of microbial diseases, will be an additional strength of BASILEA Pharmaceutica. Exploitation of the rich diversity of natural products will be driven by innovative and miniaturised screening technologies.

New Members

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Lectures

Basler Chemische Gesellschaft

Donnerstag, 17.30 Uhr
Institut für Organische Chemie, Kleiner Hörsaal

11. Jan. 2001 Prof. Dr. *Karl Wieghardt*
Max-Planck.Institut für Strahlenchemie, D-Mülheim a.d.R.
'Eisen(V) in der Koordinationschemie und in der Biologie'

25. Jan. 2001 Dr. *Elles Steensma*
Dept. of Biochemistry, Uppsala University, S-Uppsala
'Haem Ligation and Conformational Plasticity in the Isolated C Domain of Cytochrome CD1 Nitrite Reductase'

Berner Chemische Gesellschaft

Donnerstag, 11. Januar 2001, 18.15 Uhr
Hauptgebäude der Universität Bern, Kuppelraum
Hochschulstrasse 4, 3012 Bern

THEODOR KOCHER PREIS DER UNIVERSITÄT BERN

Vortrag des Preisträgers 2000

Prof. *Thomas Brunold*
Department of Chemistry, University of Wisconsin, USA
'Spektroskopische und rechnerische Untersuchung von Eisen- und Mangan-haltigen Superoxid-Dismutasen: Einblick in die Feinabstimmung der Reaktivität von Metallzentren in Proteinen'

Mittwoch, 31.1.2001, 16.30 Uhr
Hörsaal EG 16, Departement für Chemie und Biochemie, Freiestr. 3
(Kaffee um 16.10 Uhr vor dem Hörsaal)

Dr. *A. Pfeifer*
Nestlé Forschungszentrum, Lausanne
'Fundamental Foods, a Research and Communication Challenge!'

Freiburger Chemische Gesellschaft (FCG)

Dienstag, 17.15 Uhr
Grosser Hörsaal der Chemie-Institute der Universität (Pérolles)

9. Jan. 2001 Prof. *A. Shah*
Institut de Microtechnique, Neuchâtel
'Thin Film Silicon Solar Cells: Potential, Problems, Recent Progress'

23. Jan. 2001 Prof. *J.-L. Reymond*
Chemie Departement, Universität Bern
'Catalytic Antibodies: Towards Medical Applications'

6. Feb. 2001 Prof. *L. Schlapbach*
Physics Department, University of Fribourg
'Hydrogen and Carbon in Novel Materials'

Société Chimique de Genève

Lundi, 17.30 h
Amphithéatre A 150, UNI Sciences II, 30, Quai E. Ansermet

15 janvier 2001 Prof. *U. Schibler*
Université de Genève
'L'oscillateur moléculaire circadien: comment les cellules déterminent-elles le temps?'

Société Vaudoise des Sciences Naturelles

at 5 p.m.
Université de Lausanne UNIL

Jan. 17, 2001 Prof. *P. Piguet*
Auditorium A Université de Genève, CH
BEP UNIL 'Supramolecular Chemistry of Lanthanides:
Pharmacy A Challenge for the 21st Century'

Jan. 23, 2001 Prof. *F. Bellamy*
Amphithéâtre Laboratoires Fournier, Daix, France
Bât. Biologie 'Combinatorial Chemistry: Why, How and Where'
UNIL

Feb. 7, 2001 Prof. *J. Tramper*
Auditorium A Wageningen Agricultural University, Netherlands
BEP UNIL 'Modern Biotechnology: Food for Thought'
Pharmacy

Chemische Gesellschaft Zürich

jeweils am Mittwoch, 17.15 Uhr
Hörsaal CAB D2, ETH-Zentrum, Chemiegebäude
Universitätstrasse 6

17. Jan. 2001 Prof. Dr. *Jean-Louis Reymond*
Departement für Chemie und Biochemie, Universität Bern
'Exploring Biocatalysis with Catalytic Antibodies'

24. Jan. 2001 Prof. Dr. *Manfred Eigen*
Max-Planck-Institut für Biophysikalische Chemie, Göttingen
'Selektion als Phasenumwandlung im Informationsraum'

31. Jan. 2001 Prof. Dr. *Stefan Seeger*
Physikalisch-chemisches Institut der Universität Zürich
'Biochemische Analytik im Laser-Fokus: Detektion und Manipulation an biologischen Grenzflächen'

7. Feb. 2001 Dr. *Hendrik Topsoe*
Haldor Topsoe Research Laboratories, Danemark
'*In situ* Studies in Materials and Catalyst Research'

Institut für Anorganische Chemie der Universität Basel

Montag, 17.00 Uhr
Kleiner Hörsaal (2. Stock)
Spitalgasse 51, Basel

15. Jan. 2001 Prof. Dr. *Georg Süss-Fink*
Institut für Chemie, Universität Neuchâtel
'Metallorganische Chemie und katalytische Reaktionen unter Wasser: Zwei Fallstudien'

Institut de Chimie, Université de Neuchâtel

Mercredi, 10 h 30
Petit Auditoire

10 jan. 2001 Dr. *D. Guillon*
Institut de Physique et Chimie des Matériaux de Strasbourg (France)
'Oligomères conjugés mésomorphes pour la photoconduction et l'électroluminescence'

17 jan. 2001 Dr. *Thomas Bürgi*
Ecole Polytechnique Fédérale de Zürich (Suisse)
'Chiral Surfaces and Heterogeneous Enantioselective Catalysis'

Laboratorium für Organische Chemie der ETH Zürich

Montag, 16.30 Uhr
Hörsaal CHN A 31
Universitätsstrasse 16, 8092 Zürich

8. Jan. 2001 Prof. Dr. *Reinhard Brückmer*
Albert-Ludwigs-Universität Freiburg, D
'Arbeiten zur Totalsynthese des Polyol/Polyen-Antibiotikums Mycoticin B'

15. Jan. 2001 Prof. Dr. *Gary Gray*
University of Minnesota, USA
'The Reductive Cleavage Method for Polysaccharide Structural Analysis'

22. Jan. 2001 Prof. Dr. *Timothy Richmond*
ETH Zürich
'DNA Conformation in the Cell Nucleus: Chromatin's Nucleosome Core at 1.9 Å Resolution'

5. Feb. 2001 Prof. Dr. *Alois Fürstner*
Max-Planck Institut für Kohlenforschung Mülheim, D
'Olefin Metathesis and Beyond'

Laboratorium für Physikalische Chemie der ETH Zürich

Dienstag, 17.15 Uhr
Hörsaal CHN E7
Universitätstrasse 22, Zürich

9. Jan. 2001 Prof. *Vladislav Orekhov*
University Lector, Swedish NMR Center, Göteborg University, Sweden
'MUNIN: A New Approach to Multidimensional NMR Spectra Interpretation'

16. Jan. 2001 Prof. *Lyndon Emsley*
Laboratoire de Stéreochimie et des Interactions Moléculaires, Ecole Normale Supérieure de Lyon
'Solid-State NMR Experiments for Probing Molecular Structure and Dynamics'

30. Jan. 2001 *Andreas Osterwalder*
Laboratorium für Physikalische Chemie, ETH Zürich
'Millimeterschwellenspektroskopie von atomaren und molekularen Rydbergzuständen'

6. Feb. 2001 PD Dr. *Andreas Pöppl*
Fakultät für Physik und Geowissenschaften, Universität Leipzig
'Strukturaufklärung paramagnetischer Adsorptionskomplexe in porösen Festkörpern'

Laboratorium für Technische Chemie der ETH Zürich

Sicherheit und Umweltschutz in der Chemie
Freitag, 10.15 Uhr
Seminarraum CAB D43
Universitätstrasse 6

12. Jan. 2001 Dr. *Daniel Monti*
Head Process Technologies Novartis Pharma AG
'Die Rolle der Prozess-Technologie im Pharma-Unternehmen'

19. Jan. 2001 *David Bayne*
Group Energy Manager, Ciba Specialty Chemicals, Basel
'Energie-Politik und ihre globale Umsetzung in einem internationalen Chemie-Konzern'

26. Jan. 2001 Dr. *Georg Karlaganis*
Leiter Abteilung Boden, Stoffe, Biotechnologie, BUWAL, Bern
'Aktuelles aus der Umweltpolitik im Bereich Chemikalien'

2. Feb. 2001 Dr. *Hermann Held*
Potsdamer Institut für Klimafolgenforschung, D-14412 Potsdam
'Modellierung Globaler Umweltsysteme und Unsicherheitsanalys'

Der Termin und das Programm der Präsentation der Diplomarbeiten wird zu einem späteren Zeitpunkt auf unserer Web-page unter *http://ltcmail.ethz.ch/hungerb/news.html* bekanntgegeben.

Anorganisch-chemisches Institut der Universität Zürich

Freitag, 17.00 Uhr
Seminarraum 34 F 48, UZI
Winterthurerstrasse 190, Zürich-Irchel

12. Jan. 2001 Prof. *Jun Okuda*
Johannes Gutenbereg-Universität Mainz
'New Lanthanide Alkyls and Hydrides – Synthesis, Structure, and Catalysis'

19. Jan. 2001 Prof. *Peter Comba*
Universität Heidelberg
'Preorganized Ligands and Ligand Induced Distortions – Coordination Compounds with Designed Properties'

26. Jan. 2001 Prof. *Konrad Seppelt*
Freie Universität Berlin
'Small Molecules and Ions'

2. Feb. 2001 Prof. *Matthias Beller*
Institut für Organische Katalyseforschung, Universität Rostock
'Advances and Adventures in Oxidation Reactions'

Organisch-chemisches Institut der Universität Zürich

Dienstag, 17.15 Uhr
Hörsaal O3-G-91
Winterthurerstrasse 190, Zürich-Irchel

9. Jan. 2001 Prof. Dr. *Antonio Togni*
Laboratorium für Anorganische Chemie, ETH Zürich
'Die Entwicklung der katalytischen enantioselektiven Halogenierung'

16. Jan. 2001 Prof. Dr. *Michael Wink*
Institut für Pharmazeutische Biologie,
Universität Heidelberg, BRD
'Molekulare Wirkmechanismen von Alkaloiden'

23. Jan. 2001 Dipl. Chem. *Felix Keller*
Organisch-chemisches Institut, Universität Zürich
(Gruppe Dr. Rippert)
'Zink-dialkyl/diaryl-Verbindungen in der asymmetrischen Übergangsmetallkatalyse'

30. Jan. 2001 Dipl. chem. *Kathrin Brun*
Organisch-chemisches Institut, Universität Zürich
(Gruppe Prof. Heimgartner)
'Synthese von diastereoisomerenreinen 3-Amino-2H-azirinen als Bausteine für α,α-disubstituierte α -Aminosäuren'

6. Feb. 2001 Dipl. chem. *Richard Detterbeck*
Organisch-chemisches Institut, Universität Zürich
(Gruppe Prof. Hesse)
'Lust und Frust in der Polyaminchemie'

Biochemische Institute beider Zürcher Hochschulen

Donnerstag, 17.00 Uhr
UNI: Winterthurerstrasse 190, Zürich-Irchel, Hörsaal G-85
ETH: Universitätstrasse 16, ETH Zentrum, Seminarraum N 23

11. Jan. 2001 Dr. *H. Langen*
UNI BC Hoffmann-La Roche, Basel
'Application of Proteomics in the Pharmaceutical Industry'

18. Jan. 2001 *Hans-Peter Hauri*
ETH BC Biozentrum, Basel
'ERGIC53 and Membrane Traffic in the Early Secretory Pathway'

25. Jan. 2001 Prof. *M.N. Hall*
Vet.-BC Biozentrum, Universität Basel
'TOR Signalling: Temporal and Spatial Control of Cell Growth'

1. Feb. 2001 Prof. *U. Suter*
UNI BC Institut für Zellbiologie, ETH Hönggerberg
'Neuron-Glia Interactions: Lessons from Development and Diseases of the Peripheral Nervous System'

8. Feb. 2001 *Rainer Pepperkok*
ETH BC EMBL, Heidelberg, Germany
'Illuminating Structure and Function in the Early Secretory Pathway'

Kompetenzzentrum Analytische Chemie CEAC-ETHZ

http://www.ceac.ethz.ch

Donnerstag, 16.15 Uhr
Hörsaal CHN A 31, Universitätstrasse 16

18. Jan. 2001 Prof. *Frank Arnold*
Max Planck Institut
'Aerosolbildung durch den Luftverkehr'

1. Feb. 2001 Prof. *Jean Dubessy*
Université Nancy
'Perspectives in Localised Elemental Analysis Using Micro-LIBS'

Novartis-Chemistry Lectureship 2000/2001

Location: Novartis Pharma AG, Auditorium Horburg, WKL-430.3.20
Müllheimerstr. 195, CH-4057 Basel
Time: 10.30 am ('Get Together': 10.00 am)

Jan. 10, 2001 *Peter F. Leadlay*
University of Cambridge, UK

Feb. 7, 2001 *Robert H. Grubbs*
Calif. Inst. Technology, Pasadena, USA