

UNI
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INSTITUTE OF PHARMACEUTICAL TECHNOLOGY UNIVERSITY OF BASEL



Clock at the Basel Town hall (Rathausuhr).

We are happy that thanks to our dedicated graduate PhD students and staff, the Institute of Pharmaceutical Technology and the Department of Pharmaceutical Sciences enjoy an internationally recognized reputation.

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PRESENTATION OF THE INSTITUTE

A. Organisation

The Institute of Pharmaceutical Technology (Head: H.Leuenberger) is part of the Department of Pharmaceutical Sciences of the University of Basel. The Department of Pharmaceutical Sciences of the University of Basel [Uni BS] forms together with the Institute of Pharmaceutics of the Federal Institute of Technology Zürich [ETHZ] the Center of Pharmaceutical Sciences of Uni BS and ETHZ. (See the different organizational charts in the attachment). The Center of Pharmaceutical Sciences Basel-Zürich fits well into the concept to establish and strengthen the cooperation between Swiss Universities.

B. Location/Space

Basel and its neighbourhood is the home of the world famous pharmaceutical companies Novartis Pharma AG, F. Hoffmann-La Roche AG and of pharmaceutical small and medium sized enterprises as well as of the equipment manufacturer Glatt. Thus Basel provides an excellent environment for research and teaching in pharmaceutical sciences. Recently an increasing number of start-up and spin-off companies have been founded and a special platform “Bio Valley” was formed to stimulate the cooperation and foundation of companies in the area of biotechnology and pharmaceutical sciences.

The Institute of Pharmaceutical Technology is located on the second floor of the Pharmacenter of the University of Basel. Due to its research and teaching focus, the Institute of Pharmaceutical Technology requires sufficient lab space to accommodate large-size dosage form manufacturing and processing equipment. The necessary space was provided in the Pharmacenter and the external Industrial Pharmacy Laboratory (IPL) at the Mülhauserstrasse 49/51. A large part of the space is dedicated to the practical training of undergraduates (bachelor courses) and the master courses (which are in development).

C. Mission

- ∅ Excellent Teaching and Research in Pharmaceutical Technology concentrating on the application of basic physical and physical-chemical principles to dosage form (or concept) design and performance evaluation affecting drug delivery.
- ∅ Contributing to the mechanistic understanding of drug formulation, processing and delivery phenomena.

- Ø Providing students with the fundamental skills for following a career in academia, in industry or in related fields such as hospital and community pharmacy or government organizations, based on a University Diploma or PhD degree in Pharmaceutical Sciences (for industry, academia, hospital) or a Federal Diploma as a Pharmacist (for hospital and community). In 2003 the curriculum of a BSc in Pharmaceutical Sciences was adopted. Together with the master courses (in development) the MSc degree will subsequently replace the actual University diploma in Pharmaceutical Sciences.
- MAXIM: “Science fascinates us as the key for Technologies changing the world” (freely adapted from I.Asimov). Pharmacists have excellent job-opportunities in the pharmaceutical industry (see the web page of the Swiss Society of Industrial Pharmacists www.gsia.ch).

D. Teaching

D. 1. Undergraduate Teaching (Diploma students)

For the preparation of the diploma work (21 weeks) the following courses, including practical laboratory training work, are offered:

- Ø Liquid-sterile Dosage Forms
- Ø Semi-solid Dosage Forms
- Ø Solid Dosage Forms
- Ø The Seminar „Pharmaceutical Technology” complements the contents of the courses mentioned. In addition, the seminar is designed for the training of the presentation skills.

Within the following years, it is planned to update the courses taking into account new learning technologies and to have the theoretical courses available in German, English and Russian language. The Institute of Pharmaceutical Technology is a member of GPEN [Global Pharmaceutical Education Network; <http://gpen.pharmchem.ku.edu>].

D. 2. Postgraduate Teaching

D.2.1 Postgraduate education program (NDS) in cooperation with the Center of Pharmaceutical Sciences, Basel – Zürich.

In the frame of the postgraduate education program (NDS) of the Center of Pharmaceutical Sciences Basel-Zürich, the Institute of Pharmaceutical Technology and the Chair “Galenic Sciences” (Prof. H.P. Merkle, ETH Z) organised together with representatives from the pharmaceutical industry in Basel the 6-day course on “Strategies and Trends in Pharmaceutical Development and Production” that took place on 13./14.Aug., 20/21.Aug. and 3./4.Sept. 2003. The majority of the speakers/lecturers were experts from industry. The PhD students paid a moderate fee compared to participants from industry similar to the already established course on “Quality Assurance” offered by the Center. PD Dr. G. Imanidis of the University of Basel, together with Regula Furegati and Dr. Angela Küng Krähenmann, center employees, coordinate these activities, which are partly based on the former CEIP programs (Continuing Education in Industrial Pharmacy) of the Institute of Pharmaceutical Technology headed by PD Dr. G. Imanidis.

D.2.2 Co-operation with the TTC (Technology Training Center), Binzen

The Glatt Group has established a special Technology Training Center [TTC] at the Binzen Facility, Germany. Binzen is located close to Lörrach and can be reached easily on highway from Basel in ca. 20 minutes. The Institute of Pharmaceutical Technology has a close co-operation with Klaus Eichler, head of the TTC.

The program of TTC is available at the following Web Site: <http://www.ttc-binzen.de>. In case, that the courses are not overbooked a limited number of PhD students can participate at the individual courses. The participation at these courses is counted as part of postgraduate education in Pharmaceutical Technology.

D. 3. New Learning and Teaching Technologies

Co-operation with MUCTR, Moscow, Russia/Development of Curriculum

- Ø Teaching: Recently, a new Department of Technology of Chemical-Pharmaceutical and Cosmetic Products at the Mendeleev's University of Chemical Technology of Russia (MUCTR) was founded. The co-operation Basel-Moscow has the aim to exchange expertise and to step towards the creation of a Faculty of Pharmacy at MUCTR. The program has as a goal to give Russian specialists the opportunity to strengthen the knowledge in Pharmaceutical Technology: The CD-Rom Physpharm with mathematical model equation has been successfully translated into Russian by Maxim Puchkov (MUCTR) and is part of the student education at MUCTR and at the University of Basel.
Teaching Presentation; Glatt equipment: The company Glatt, Binzen, Germany is a global leader in process equipment for life sciences. The equipment and the technologies, such as fluid bed, granulating, coating, drying etc. are presented in a power point presentation and translated into Russian by Denis Shishulin, MUCTR. The teaching presentation is part of the student education in the field of modern technological equipment of pharmaceutical plants at MUCTR.
- Ø Development of an Expert System for Capsules and Tablets: The primary goal of this expert system is to create a pharmaceutical formulation database for the development and manufacturing of solid dosage forms. In addition, statistical experimental design studies and the application of artificial neuronal networks [ANN] are used for the optimisation of Pharmaceutical Dosage Forms. The idea is to use this system as a support for decision-making and as a tool in laboratory training and for development optimisation.
- Ø Computational Science Project: Mathematical modelling using data on Spray-Freeze Drying and data, which will be provided by the new prototype of this equipment at Glatt, Binzen in connection with the PhD-project of Mathias Plitzko on the "Preparation of Nanocomposites" in collaboration with the NCCR Nanocenter in Basel (Prof. Güntherodt, group "Nanoscience in Medicine" of Prof. U. Aebi, Biocenter of the University of Basel).

E. Research

E. 1. Introductory remarks

Our research in pharmaceutical technology concerns the design and the preparation of dosage forms for a safe transport of the active substance (drug-load) to its site of action, i.e., the precise amount of drug should be delivered at the right time at the right site in order to perform its optimal therapeutic effect (with minimal side effects)! The design, the development and the manufacture of dosage forms are often declared in industry as the core activity or core business of industrial pharmacists since today most of them work in this area. Due to its complexity, the design of drug formulations is so far mainly based on empirical knowledge often simply using the “trial and error” approach. Thus, there is a need for action.

Solid dosage forms representing the majority of prescribed medications, presently and most likely also in the future, are no exception as the science and technology of powders are still in the state of infancy. Research in the field of dosage forms, being products with a high added value, should therefore be rewarding.

E. 2. Research Focus/Objectives

Our ambitious objective is to develop a **rigorous scientific framework for the design of formulations** and for drug processing using solid dosage forms as typical model formulations. The ultimate goal is not only to have a mechanistic understanding of formulations and processes but also to develop first principles. These topics fit ideally the goals of FDA for a drug quality system for the 21st century and FDA’s PAT initiative (www.fda.gov/cder/OPS/PAT.htm).

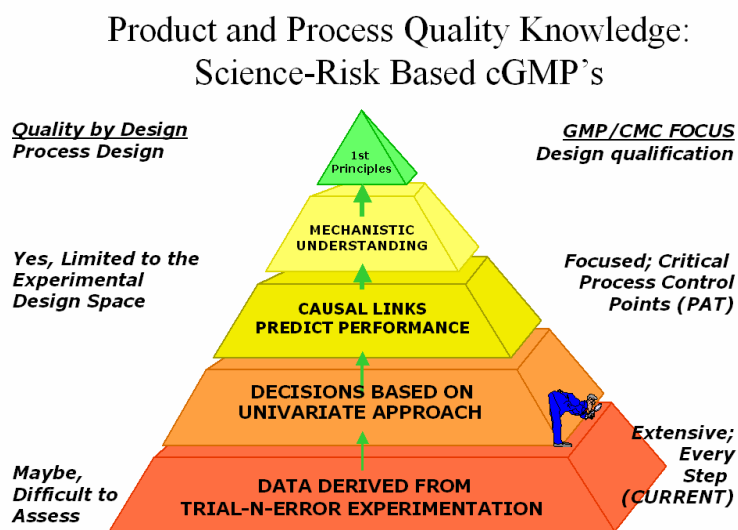


Figure E. 2.1 Science Pyramid
(Presentation A. Hussain,
Feb. 16, 2004,
Pharmacenter Basel)

This focus leads to an expertise in powder technology, which is a prerequisite for a safe scale-up and for the design of novel drug delivery systems such as particles to be inhaled, i.e. for pulmonary administration. For this reason it is important to explore innovative process technologies taking into

account the **opportunities of nanoscience** and nanotechnology in order to solve present problems of novel drugs such as poor water solubility and the parenteral administration of proteins. Due to the high density of pharmaceutical expertise in Basel a complementary focus in research resides in the close **cooperation with the pharmaceutical industry** including the Glatt Company as manufacturer for process equipment for the pharmaceutical industry. The goals of these activities are to create win-win situations and to compensate as much as possible the lack of university resources for the department of Pharmaceutical Sciences at the University of Basel.

For dosage form design guaranteeing optimal drug delivery characteristics, drug specific properties such as solubility and biomembrane permeability as well as interaction of the dosage form at the site of application must be taken into account. This is a further research focus of the Institute of Pharmaceutical Technology under the guidance of PD Dr. Georgios Imanidis, Deputy Head of the Institute, with the objective to develop **models for a mechanistic understanding of drug transport through biological membranes**, notably human epidermis, intestinal epithelium simulated by the Caco-2 cell culture system and artificial phospholipid membranes, and discover **delivery system-based methods to influence it**.

E. 3. Research Areas

E.3.1 Main Areas

Research in Powder Technology

- Ø Dry and Moist Agglomeration of Powder, i.e. Granulation, Tableting
- Ø Control and Scale-up of the Moist Agglomeration Process
- Ø Computer assisted Design of Solid Dosage Forms
- Ø Preformulation and Formulation Research

New Process Technologies

- Ø Vacuum Fluidised Bed System
- Ø Spray Freeze Drying at Atmospheric Pressure
- Ø Scale-up in the 4th Dimension (Moist Agglom. and Drying Process)
- Ø Supercritical CO₂ and Liposomes
- Ø High Temperature Short Time Sterilization

Basic Research Activities (SNF, Industry)

- Ø Application of Percolation Theory and Fractal Geometry
- Ø Formulation Research: Robustness and Percolation Thresholds (Critical Concentrations)
- Ø Multicomponent Formulations: Fractals and Order in a Chaotic System
- Ø Solubility, Structure of Water, Hydrophilic Solutions

Drug Absorption; (PD Dr. G. Imanidis)

- Ø Interface Dosage Form/Body of Patient
- Ø Drug Transport: Intestine/Systemic Circulation
- Ø Transmucosal, Transepithelial Transport
- Ø Problem of Bioavailability of topical dosage forms
- Ø Problem of Drugs with a Poor Water Solubility

Specifically, research related to Drug Absorption is subdivided into two focus areas:

1. Dermal (topical) and transdermal (systemic) delivery of drugs including low molecular weight organics and peptide analogues employing formulation design and iontophoresis as a means to modulate and enhance delivery rate.
Fundamental *in vitro* studies of the effect of phase structure in multi-phasic systems and of parameters involved in iontophoresis (pH micro-environment, electroosmotic flow, fraction of aqueous channel pathway) are undertaken, modelling processes based on physicochemical principles to allow quantitative assessment of the influencing factors. Simultaneous transport and metabolism in the skin is considered, drug concentration within cutaneous tissue is estimated and pharmacological concentration/response relationships established *in vivo* using site of action concentration as a measure of skin bioavailability.
2. Intestinal drug absorption using the Caco-2 cell line and phospholipid vesicles as model to simulate the absorption epithelium. A mechanistic approach is taken to identify the routes that are relevant for transepithelial transport of drugs and to establish possible relationships between the fluidity of the plasma membrane of the cells and the phospholipid bilayer of the vesicles and the permeation rate. Steady state and real time fluorescence depolarisation measurements are used to obtain a measure of membrane fluidity and the effect of adjuvants such as surfactants and lipids contained in drug formulations on the membrane is evaluated. The interrelation between membrane properties and the function of efflux mechanisms such as those related to P-glycoprotein is studied and cellular pharmacokinetics considering transport and metabolism established.

E. 4. Research Policy

- Ø Problem oriented, derived from needs, (Applied and Basic Research)
- Ø Themes, Projects are interrelated. Identification of interesting Niche Topics
- Ø Optimisation of Return on Investment
- Ø Close Cooperation with the Industry (Pharma, Equipment Manufacturer)

E. 5. Important Research Papers

E.5.1 Application of Percolation Theory and Fractal Geometry

- Ø Percolation Theory, Fractal Geometry and Dosage Form Design, H.Leuenberger, L.Holman, M.Usteri and S.Winzap, *Pharm.Acta Helvetiae* **64**:34-39 (1989).
- Ø The application of percolation theory in powder technology (Invited review), Hans Leuenberger, *Advanced Powder Technology* **10**:323-353 (1999)

E.5.2 New Process Technologies

- Ø Granulation and Drying in Vacuum Fluidised Bed Systems, B.Luy, B.Hirschfeld and H.Leuenberger, *Drugs made in Germany* **32**:3-8 (1989).
- Ø Atmospheric Spray Freeze Drying: a suitable alternative in freeze drying technology, M.Mumenthaler and H.Leuenberger, *Int.Journal of Pharm.* **72**:97-110 (1991)
- Ø Scale-up in the field of Granulation and Drying. Chapter 6. Bookchapter, in english. Hans Leuenberger, *Drugs and the Pharmaceutical Sciences*, Volume 118, ISSN 0360-2583. Pharmaceutical Process Scale-Up 118 2001, 151-170. ISBN 0-8247-0625-0. Editor Levin Michael.
- Ø New Trends in the Production of Pharmaceutical Granules: Batch versus Continuous Processing. Publication, in english. Hans Leuenberger, *Eur.J.Pharm.Biopharm.* 52 (3), 2001, 289-296. ISSN 0939-6411.
- Ø New Trends in the Production of Pharmaceutical Granules: The classical batch concept and the problem of scale-up. Publication, in english. Hans Leuenberger, *Eur.J.Pharm.Biopharm.* 52 (3), 2001, 279-288. ISSN 0939-6411.
- Ø Thermal Sterilization of Heat Sensitive Products using High-Temperature Short-Time Sterilization. Publication, in english. Angelika Mann, Markus Kiefer, Hans Leuenberger, *J.Pharm.Sci.* 90 (3), 2001, 275-287. ISSN 0022-3549.
- Ø Spray Freeze Drying - The Process of Choice for low water soluble Drugs? Publication, in english. Leuenberger Hans, *J.Nanop.Res.* 4 (1,2), 2002, 111-119. ISSN 1388-0764.

E.5.3 Experimental Design; Surface Response Methodology

Artificial Neural Networks; Expert Systems

- Ø A Factorial Design for Compatibility Studies in Preformulation Work, H.Leuenberger and W.Becher, *Pharm.Acta Helv.* **50**:88-91 (1975).
- Ø Mathematische Modellierung und Optimierung pharmazeutisch-technologischer Qualitätsmerkmale fester Arzneiformen, H.Leuenberger, P.Guitard und H.Sucker, *Pharmazie in unserer Zeit* **5**:65-76 (1976).
- Ø Basic Concepts of Artificial Neural Networks (ANN) Modelling in the Application to Pharmaceutical Development, J.Bourquin, H.Schmidlin, P.vanHoogevest and H.Leuenberger, *Pharm.Development and Technology* **2**:95-109 (1997).

- Ø Advantages of Artificial Neural Networks (ANNs) as alternative modeling technique for data sets showing non-linear relationships using data from a galenical study on a solid dosage form. Publication, in english. Jacques Bourquin, Heinz Schmidli, Peter van Hoogevest, Hans Leuenberger, *Eur.J.Pharm.Sci.* 7 (1), 1998, 5-16. ISSN 0928-0987.
- Ø Comparison of artificial neural networks (ANN) with classical modeling techniques using different experimental designs and data from a galenical study on a solid dosage form. Publication, in english. Jacques Bourquin, Heinz Schmidli, Peter van Hoogevest, Hans Leuenberger, *Eur.J.Pharm.Sci.* 6 (4), 1998, 287-301. ISSN 0928-0987
- Ø Pitfalls of artificial neural networks (ANN) modeling technique for data sets containing outlier measurements using a study on mixture properties of a direct compressed dosage form. Patent Specification, in english. Jacques Bourquin, Heinz Schmidli, Peter van Hoogevest, Hans Leuenberger, *Eur.J.Pharm.Sci.* 7 (1), 1998, 17-28. ISSN 0928-0987.

E.5.4 Drug Delivery through Biological and Artificial Membranes

- Ø G.Imanidis, K.C.Hartner and N.A.Mazer. Intestinal Permeation and Metabolism of a Model Peptide (Leuprolide) and Mechanisms of Permeation Enhancement by Non-Ionic Surfactants. *Int.J.Pharm.* **120**:41-50 (1995).
- Ø G.Imanidis, C.Waldner, C.Mettler and H.Leuenberger. An Improved Diffusion Cell Design for Determining Drug Transport Parameters across Cultured Cell Monolayers. *J.Pharm.Sci.* **85**:1196-1203 (1996).
- Ø G.Imanidis, S.Helbing-Strausak, R.Imboden and H.Leuenberger. Vehicle-dependent *In Situ* Modification of Membrane-controlled Drug Release. *J.Control.Release* **51**:23-34 (1998).
- Ø R.Imboden and G.Imanidis. Effect of the Amphoteric Properties of Salbutamol on its Release Rate through a Polypropylene Control Membrane. *Eur.J.Pharm.Biopharm.* **47**:161-167 (1999).

E. 6. Suggested Further Reading

E.6.1 Application of Percolation Theory and Fractal Geometry

- Ø Fractal Dimension of Porous Solid Dosage Forms, M.Usteri, J.D.Bonny and H.Leuenberger *Pharm.Acta Helv.* **65**:Nr. 2 (1990): 55-61.
- Ø Formation of a Tablet: A Site-Bond Percolation Phenomenon, H.Leuenberger and R.Leu *J.Pharm.Sci.* **81**:Nr. 10 (1992): 976-982.
- Ø Matrix-Type Controlled Release Systems: I. Effect of Percolation on Drug Dissolution Kinetics, J.D.Bonny and H.Leuenberger *Pharm.Acta Helv.* **68**:(1993): 25-33.
- Ø Percolation Effects in Matrix-Type Controlled Drug Release Systems, H.Leuenberger, J.D.Bonny, M.Kolb *Int.J.of Pharm.* **115**:(1995): 217-224.
- Ø Use of Percolation Theory to Interpret Water Uptake, Disintegration Time and Intrinsic Dissolution Rate of Tablets Consisting of Binary Mixtures, R.Luginbühl and H.Leuenberger *Pharm.Acta Helv.* **69**:(1994): 127-134.
- Ø Percolation Theory and Robust Formulations in Powder Technology, H. Leuenberger in Proceedings '96 China-Japan Symposium on Particuology edited by Yong Jin, Mooson Kwauk, Genji Jimbo and Yasuo Konseka, Tsinghua University Beijing May 24-25, 1996.

E.6.2 Process Technology/Solid Dosage Form Design

- Ø Theory of the Granulating Liquid Requirement in the Conventional Granulation Process, H.Leuenberger, H.P.Bier and H.Sucker *Pharm.Techn.Intern.* **3**:(1979): 60-67.
- Ø Scale-up of Granulation Processes with - Reference to Process Monitoring, *Acta Pharm.Techn.* **2**:(1983): 274-280.
- Ø Monitoring Mass Transfer Processes in order to control moist agglomeration, H.Leuenberger and G.Imanidis *Pharm.Techn.* **10**:(1986): 56 - 73
- Ø Monitoring the Granulation Process: Granulate Growth, Fractal Dimensionality and Percolation Threshold, H.Leuenberger, M.Usteri, G.Imanidis and S.Winzap *Boll. Chim. Pharm.* **128**:(1989): 54-61.
- Ø Agglomeration of Binary Mixtures in a High-Speed Mixer, M.Usteri and H.Leuenberger *Int.J.of Pharm.* **55**:(1989): 135-141.
- Ø Design and Modification of Powders - A Must in Pharm. Technology, H.Leuenberger, Proceedings 2nd World Congress Particle Technology, Sept. 19-22, 1990, Kyoto, Japan Vol. III. p. 317-328, The Society of Powder Technology, Japan.
- Ø Design and Optimisation Approaches in the Field of Granulation, Drying and Coating, H.Leuenberger Pharmacy World Congress '93, Tokyo, Proceed. of the 53rd Int. Congress of Pharm. Sciences 1993, Editors: D.J.S.Crommelin, K.K.Midha, T.Nagai, Medpharm. Scientific Publishers, Stuttgart 1994, p. 493-511.

E.6.3 New Process Technologies

- Ø Prozess-Monitoring bei der Emulsionsherstellung; Drehmomentenmessung als Inprozesskontrolle bei der Emulsionsherstellung, R.Randegger, G.Imanidis, R.D.Juch, G.Birrenbach, H.Leuenberger *Pharm.Ind.* **56**:(1994): 648-654
- Ø Wet spherical agglomeration of proteins as a new method to prepare parenteral fast soluble dosage forms, A.Bausch and H.Leuenberger *Int.J.of Pharm.* **101**:(1994): 63-70
- Ø List of Preparation of Liposomes Encapsulating Water Soluble Compounds Using Supercritical Carbon Dioxide, L.Frederiksen, K.Anton, P.vanHooegevest, H.R.Keller and H.Leuenberger *J.Pharm.Sci.* **86**:(1997): 921 -928.

E.6.4 Drug Delivery through Biological and Artificial Membranes

- Ø P.Lütolf, G.Imanidis and H.Leuenberger. Transdermal Iontophoresis of an Amphoteric Compound: Effect of Charge and Interaction with Human Skin, In: P.Couvreur, D.Duchéne, P.Green and H.E.Junginger (Eds.), Transdermal Administration, A Case Study, Iontophoresis, Editions de Santé, Paris, 1997, pp. 360-364.
- Ø G.Imanidis and R.Imboden. Utilizing Vehicle Imbibition by a Microporous Membrane and Vehicle Viscosity to Control Release Rate of Salbutamol, *Eur. J. Pharm. Biopharm.* **47**:283-287 (1999).
- Ø F.P.Schwarb, G.Imanidis, E.W.Smith, J.M.Haigh and C.Surber. Effect of Concentration and Degree of Saturation of Topical Fluocinonide Formulations on *In Vitro* Membrane Transport and *In Vivo* Bioavailability on Human Skin. *Pharm. Res.* **16**:909-915 (1999).

E. 7. Publications: Institute of Pharmaceutical Technology 1998-2002

1998

Advantages of Artificial Neural Networks (ANNs) as alternative modeling technique for data sets showing non-linear relationships using data from a galenical study on a solid dosage form. Publication, in english. Jacques Bourquin, Heinz Schmidli, Peter van Hoogevest, Hans Leuenberger, Eur.J.Pharm.Sci. 7 (1), 1998, 5-16. ISSN 0928-0987.

Comparison of artificial neural networks (ANN) with classical modeling techniques using different experimental designs and data from a galenical study on a solid dosage form. Publication, in english. Jacques Bourquin, Heinz Schmidli, Peter van Hoogevest, Hans Leuenberger, Eur.J.Pharm.Sci. 6 (4), 1998, 287-301. ISSN 0928-0987.

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E. 8. Contribution by External Docents (see also attachment)

- Ø Prof. Theodor Güntert, PhD, having important responsibilities in his job at Roche Basel is lecturing Biopharmaceutical and Pharmacokinetic topics and is supervising a tutorial with practical applications of Pharmacokinetic data. The list of his publications in 2003 can be found in the attachment.
- Ø PD Daniëlle Giron, PhD, is expert and head of the Thermoanalytic laboratory at Novartis Pharma Ltd. Her contribution teaching thermoanalytical topics is highly appreciated. Her publications are listed in the attachment.
- Ø PD Peter van Hoogevest, PhD, is an expert in the formulation and the manufacture of liposomes. He is COO of Phares Drug Development Ltd., Muttentz, a company specialised in liposomal technologies and applications. He is teaching liposomal related topics (including practical training) at the Institute of Pharmaceutical Technology.
- Ø PD Stephan Marrer, PhD, from F. Hoffmann-La Roche AG, is teaching Quality Assurance topics and is tutor in the seminar for Pharmaceutical Technology.
- Ø Ottheinrich Eichhorst, PhD, has completed his study as a Pharmacist in 1999 and started to collaborate in 2000 with the Institute of Pharmaceutical Technology.
- Ø Klaus Eichler is head of the Technology Training Center at Glatt in Binzen, BRD. He is an excellent organiser and moderator of Meetings, Workshops and Symposia world-wide. The Institute of Pharmaceutical Technology is proud of working with him for years.
- Ø Claudia Reinke, PhD, has a degree in biology (PhD) and pharmacy (diploma). She owns the company MedSciences, Basel.
- Ø PD Michel Ulmschneider, PhD, is private docent at the Université de Haute Alsace, Mulhouse and is teaching chemometrics for advanced students in pharmaceutical sciences.
- Ø Bernd Herzog, PhD, is head of several R+D application labs at Ciba Specialty Chemicals Inc., Grenzach-Wylen within the segment of home and personal care (main focus on sun screens for skin protection).

F. Curriculum Vitae

F. 1. G. Betz

Personal information:

Date of birth 27th of February 1971
Place of birth Ravensburg/Germany

Education:

1990 Allgemeine Hochschulreife (Abitur) at Matthias Erzberger Schule, Biberach/Riss, Germany
1990-1996 Pharmacy studies at Albert Ludwig University, Freiburg, Germany
Practical year at Ciba AG, Wehr, Germany and Apotheke Stadtmitte, Stuttgart, Germany
1996-2000 Ph.D. study under the supervision of PD. Dr. G. Imanidis and Prof. Dr. H. Leuenberger at Institute of Pharmaceutical Technology, University of Basel, Switzerland with the title:
“Heparin Penetration into and Permeation through Human Skin from Aqueous and Liposomal Formulations In vitro and Interactions of Phospholipids with Skin.”

Professional activities:

1996-2000 Lectureship in practical university courses of the liquid sterile dosage forms and liposomal formulations.
Lectureship and workshop in oral scientific presentation technique and body language.
2001-2002 Postdoctoral-fellow and head teaching assistant under Prof. Dr. H. Leuenberger at Institute of Pharmaceutical Technology, University of Basel, Switzerland.
Since 2002 Head of the Industrial Pharmacy Lab and head teaching assistant at Institute of Pharmaceutical Technology, University of Basel, Switzerland.

F. 2. G. Imanidis

Georgios Imanidis, June 8, in Serres, Greece

born 1958

EDUCATION

High school (gymnasium) education with emphasis on sciences in Serres, Greece	1973 – 1976
University admission examination	1976 June
Pharmacy studies at the Aristotelion University of Thessaloniki, Thessaloniki, Greece	1976 – 1980
Graduation with the Pharmacy degree	1980 Nov.
Post-graduate studies in Pharmaceutical Technology and Industrial Pharmacy at the „Pharmazeutisches Institut“ of the University of Basel, Basel, Switzerland	1980 – 1982
Advanced diploma in Pharmaceutical Technology,	1982 Dec.
Ph.D. thesis in Pharmaceutical Technology under the supervision of Prof. H. Leuenberger at the „Pharmazeutisches Institut“ of the University of Basel, Basel, Switzerland	1983 – 1986
Doctor of Philosophy degree	1986 Feb.

PROFESSIONAL APPOINTMENTS

Part-time (50%) teaching assistant in Pharmaceutical Technology at the „Pharmazeutisches Institut“ of the University of Basel, Basel, Switzerland	1983 – 1986
Post-doctoral fellow in Drug Delivery Research under Prof. W.I. Higuchi in the Department of Pharmaceutics, University of Utah, Salt Lake City, UT, U.S.A.	1986 – 1988
Senior research scientist in the Department for Drug Absorption Studies, TheraTech, Inc., Salt Lake City, UT, U.S.A.	1988 – 1990
Adjunct staff scientist in the Department of Pharmaceutics, University of Utah, Salt Lake City, UT, U.S.A.	1988 – 1990
Recipient of a scholarship from the Roche Research Foundation to study drug absorption using cell cultures as an alternative to animal experiments at the „Pharmazeutisches Institut“ of the University of Basel, Switzerland	1991 – 1992
Scientific staff member, „habilitand“, and head teaching assistant at the „Pharmazeutisches Institut“ of the University of Basel, Department of Pharmaceutical Technology, Basel, Switzerland	1992 – 1999
Awarded the title of a docent „PD“ by the Faculty of Natural Sciences of the University of Basel through the process of „Habilitation“.	2000
Faculty member (full time) at the Institute of Pharmaceutical Technology, University of Basel, Switzerland, by virtue of the docent “PD” title awarded by the Faculty of Natural Sciences of the University of Basel through the process of “Habilitation”.	since 2000

F. 3. H. Leuenberger

	EDUCATION
Diploma in Experimental Physics (University of Basel)	1967
PhD-Thesis in Nuclear Physic (University of Basel)	1971
INDUSTRIAL CAREER	
Head of R+D Laboratory (Preformulation work) Analytical R+D Department, Sandoz Ltd., Basel	1971-1973
Research Group Leader, Pharmaceutical R+D, Sandoz Ltd., Basel	1973-1982
SABBATICALS AND EXPERIENCES ABROAD	
University of Hamburg (Prof. Dr. H. Sucker) Germany	1973
University of Michigan, Ann Arbor (Prof. Dr. W.I. Higuchi, Prof. Dr. N.F. Ho, Dr. E.W. Hiestand), U.S.A.	1979
Head Pharma R+D, Sandoz España, Barcelona ad interim (Spain).	1980
CAREER IN ACADEMIA	
Part Time Lecturer at the University of Basel as Private Docent (PD) in Pharmaceutical Technology	1980
Full-Time Ordinary Professor of Pharmaceutical Technology and Head of the Institute of Pharmacy at the University of Basel, Totengässlein 3, CH-4051 Basel (Historical Site close to the Museum)	1982
Planning of a new building for the Institute of Pharmacy	1982-2000
Member of the Expert Group 12 (Pharmaceutical Technology) of the European Pharmaceutical Commission, Strasbourg, France	1988-1993
Dean of the Faculty of Natural Science at the University of Basel, Founder of the Faculty Committee of Department Heads	1994/95
President of the Scientific Council [SC] of the Swiss Academy of Engineering Science [SATW] and founder of the Lateral Think Tank of the SC	1992-96
Vice President of the Swiss Academy of Engineering Science	1993-2001
President of the Swiss Society of Pharmaceutical Sciences (SGPhW)	Since Oct. 2001
Member of Editorial Advisory Board (such as J.Pharm.Sci. 1990/92), Referee for different journals, Member of peer review committees: ETHZ (1993), University of Groningen and Utrecht (1997), Publications: more than 180, Patents: ten.	

F. 4. Research Awards, Medals, Nominations (Membership Awards)

H. Leuenberger, on behalf of the Institute of Pharmaceutical Technology:

- ∨ Member of Swiss Academy of Engineering Sciences since 1987.
- ∨ University of Helsinki Medal 1989.
- ∨ Fellow of the American Association of Pharmaceutical Scientists [AAPS] since 1990.
- ∨ AAPS Research Award in Pharmaceutical Technologies 1993.
- ∨ Innovation Award for New Process Technologies of the Governments Basel-City and Basel-Country 1994.
- ∨ Honorary Member of the Swiss Society of Industrial Pharmacists [GSIA] since 1994.
- ∨ Jörg Bider Medal of the Swiss Society of Pharmacists [SAV] 1997.
- ∨ Corresponding Member of the Royal Academy of Pharmacy of Spain since 1998.
- ∨ Foreign Member of the Russian Academy of Engineering Sciences since 1998.
- ∨ IPS Medal 2000 [Industrial Pharmacy Section] of FIP [Fédération Internationale Pharmaceutique]. 2000.
- ∨ Member of the Scientific Advisory Board of the Grand École des Mines, Albi, France, since 2001.
- ∨ Award of Particulate Preparations and Design of the Society of Powder Technology of Japan, Kyoto, Japan, 2001.
- ∨ Honorary member of the Swiss Academy of Engineering Sciences since 2001.

G. Research and Co-operation Network

G. 1. Academia

China Pharmaceutical University, Nanjing, P.R. China[∨]

Federal Institute of Technology [ETH] Zürich[∨]

École des Mines, Albi, France[∨]

Gifu Pharmaceutical University, Gifu Japan[∨]

Institute of Hospital Pharmacy, Basel

Institute of Informatics, University of Basel

Mahidol University, Bangkok, Thailand[∨]

[∨] Based on formal agreements. (Activity depending on projects, time and resources).

Mendeleyev University of Chemical Technology of Russia [MUCTR], Moscow^{*}

Spitalapotheke, Kantonsspital Aarau

University of Kansas, Lawrence, Kansas, USA^{*}

University of Seville, Seville, Spain^{*}

G. 2. Industrial Partners

ADD, Advanced Drug Delivery Technologies, Reinach

Asulab AG, Neuchâtel

Bachem AG, Bubendorf

Capsugel Ltd., Arlesheim

Ciba Specialty Chemicals, - Grenzach D

Drossapharm AG, Arlesheim

Glatt AG, Pratteln

Glatt GmbH, Binzen, BRD

Glatt, System Techniques, Dresden, BRD

Mepha AG, Aesch

Novartis Animal Health Ltd, Basel

Novartis Pharma Ltd., Basel

Pentapharm AG, Aesch

Pfizer GmbH, Arzneimittelwerk Gödecke, Freiburg i.Br.

Phares Ltd., MuttENZ

Pharmatrans Sanaq AG, Basel

Roche Ltd., Basel

Roche Ltd., Grenzach, BRD

Skye Pharma, MuttENZ

Spirig AG, Egerkingen

^{*} Based on formal agreements.

G.2.1 Cooperation with the Technology Training Center (TTC) in Binzen (D)

In 2003 the cooperation was intensified and much more PhD students postdocs could participate at the TTC events than in the years before. In addition our cooperation partners from Mendeleyev University of Chemical Technology of Russia (MUCTR) could participate as well. Very beneficial was also a regular mutual exchange of practical experience concerning the project of hot melt pellets produced in a Glatt fluidised bed equipment.

H. Progress Report 2003

H. 1. Special Events 2003

H.1.1 Evaluation of the Institute of Pharmaceutical Technology

A team of international experts visited the Institute of Pharmaceutical Technology between February 9 - 13, 2003 and wrote an evaluation report about the Department of Pharmaceutical Sciences at the University of Basel and about the Institute of Pharmaceutical Sciences at the Federal Institute of Technology in Zürich. The evaluation team was headed by

Prof. Dr. Daan J.A. Crommelin Utrecht University, Utrecht Institute for Pharmaceutical Sciences (UIPS) and included

Prof. Dr. Ronald T. Borchardt, University of Kansas, Department of Pharmaceutical Chemistry;

Prof. Dr. Hartmut Derendorf, University of Florida, Pharmaceutics Department;

Prof. Dr. Theo Dingermann, Johann Wolfgang Goethe-Universität Frankfurt;

Prof. Dr. Alexander Florence, University of London, Center for Drug Delivery Research;

Dr. René Imhof, F. Hoffmann - La Roche AG.

The following statement is an extract of the report concerning the Institute of Pharmaceutical Technology. The citation is exact with the exception that the name of the head of the institute, cited in the original report was exchanged by the name “institute” in order to indicate that the achievements are a cooperative effort of all members of the Institute. This cooperative effort is especially acknowledged by the author of this annual report.

“The institute is internationally recognised in the field of pharmaceutical technology. This field is highly relevant to the pharmaceutical industry, but enjoys little interest in the academic pharmaceutical research centers: many departments were closed over the last twenty years, not because of lack of importance of the subject, but because of the move to more biological topics. Worldwide only a few institutes are left and the institute in Basel is among the top centers. The activities of the institute are focused on a better understanding the behaviour of ‘complex systems’. These activities fit very well in the framework of the Center for Pharmaceutical Sciences, where its ‘counterpart’, Prof. H. P. Merkle, focuses on the drug targeting and (pre)formulation of biopharmaceuticals. The institute was able to mobilise a lot of support from industry. This, for example, is reflected by the number of Ph.D. students who are supported by industry. A considerable number of Ph.D. students also perform their actual research in the sponsoring company. The institute was instrumental in setting up the Industrial Pharmacy Lab, where indeed scale up research can be performed. This is a unique achievement.”

H.1.2 Irma Tschudi-Steiner Award

The “Irma Tschudi-Steiner Preis“ of the Faculty of Natural Science for the best female PhD student of the department of pharmaceutical sciences.



Prof. Dr. Irma Tschudi-Steiner (see photo left) was the first female docent of the Faculty of Natural Sciences at the University of Basel. In 2003 she established the “Irma Tschudi-Steiner Preis”–foundation. Thus each two years the best female PhD student of the department of pharmaceutical sciences can be awarded by the Faculty of Natural Science with this award. At the DIES ACADEMICUS, November 28, 2003 Dr. Verena Schröder of the Institute of Pharmaceutical Technology was the first to be awarded with this prize, for her thesis „Role of blood coagulation factor XIII in vascular diseases and characterisation of genetic variants”.

H.1.3 Offer of the École des Mines Albi-Carmaux

The head of the Institute of Pharmaceutical Technology is member of the Scientific Advisory Board of the Grand École des Mines, Albi-Carmaux. The total of seven Grand École des Mines (GEM) are the top Engineering Schools of France and have different specialities (figure H.1.3.1). The École des Mines d’Albi offers a specialization in Pharmaceutical Engineering. Pharmacists with a diploma in Pharmacy of the University of Basel are invited to study two more years in Albi to obtain an additional diploma in Pharmaceutical Engineering, which is recognised in the European Union. It may be also of interest for a pharmacist having a PhD in Pharmaceutical Sciences to spend two years as a postdoc in France to obtain such a diploma in Engineering (figure H.1.3.2). For further information: Contact the head of the Institute of Pharmaceutical Technology.

Graduate programs	Paris	Saint-Etienne	Albi-Carmaux	Alès	Douai	Nantes	Nancy
Pharmaceutical and Bio Engineering			I, D, TM *				
Earth Sciences & Civil Engineering	D			I	I, D		I, D, TM
Information, Control & Computer Engineering	I, D, TM	I, D, TM	I	I, D, TM	Doc	I, D, TM	I, D, TM
Energy and Nuclear Engineering	D, TM	I, D, TM	I, D		I, D	I, D	I, TM
Environmental Management & Engineering	I, TM	I, TM, D	I, D, TM	I, D, TM	I, D	I, D, TM	
Industrial and Systems Engineering		I, D	I, D	D, TM	I, D, TM	I, D, TM	I, TM
Materials Sciences and Engineering	D, TM	D, TM	I, D, TM	I, D	I, D, TM		I, D
Mechanical Engineering		I	I	I	I, D		
Science & Executive Management	I	I					I
Economics & Social Sciences	D, TM						
Electrical Engineering		I, D					

* : Ingénieur Diploma (I), Doctor's Degree (D), Thematic Master's Degree (TM)

Figure H.1.3.1

DOUBLE DIPLOME

La formation N° 1 en France
d'ingénieurs en
Génie Pharmaceutique

**Pharmacien :
Devenez
ingénieur !**

avec seulement une année d'études
supplémentaire !


ECOLE DES MINES D'ALBI
C A R M A U X

Renseignements :
Ecole des Mines d'Albi-Carmaux
Campus Jarlard - Route de Teillet
81013 ALBI CT Cedex 09
Tél : 05 63 49 30 45
courriel : admissions@enstimac.fr
site : <http://www.enstimac.fr/>



FORMATION PHARMACIEN-INGÉNIEUR
Demande de renseignements

Mlle, Mme, M. : _____ Prénom : _____

Nom : _____

Adresse : _____

Code postal : _____ Ville : _____

Tél. : _____

M.M. : _____


Etudiant, Autre (préciser) : _____


Faculté : _____


Option : _____


Je souhaite recevoir des informations sur la formation de
Pharmacien-Ingénieur


Année : _____

 **Pour une carrière de haut niveau dans l'industrie pharmaceutique,**
Enrichissez votre formation dans les domaines scientifique, technique et managérial : devenez ingénieur de l'Ecole des Mines d'ALBI !

 **La formation de pharmacien-ingénieur :**
✓ S'adresse à des étudiants en pharmacie ayant validé la 5^e année (filière industrielle).
✓ Vous permet, avec une seule année supplémentaire, d'obtenir le double diplôme de pharmacien et d'ingénieur.





 **L'Ecole des Mines d'Albi : Une école d'ingénieurs largement reconnue dans l'industrie pharmaceutique.**
✓ Des options de fin d'études en génie pharmaceutique, génie industriel.
✓ 25% de nos anciens élèves travaillent dans l'industrie pharmaceutique.
✓ Une forte activité de recherche au bénéfice des industries de la santé.

DEROULEMENT DE LA FORMATION

Pharmacie			Ecole des Mines		Diplôme d'Ingénieur	Diplôme de pharmacien
Années	3	4	5	6	7	

Ecole des Mines d'Albi-Carmaux
Service Admissions
Campus Jarlard
81013 ALBI CT Cedex 09

Figure H.1.3.2

H.1.4 Invitation to cooperate with FDA in the area of PAT (Process Analytical Technology)

FDA pushes forward a new concept for the quality assurance of drugs and has launched the so-called PAT initiative. The reason for this push is related to the following fact:

The quality of manufacturing processes of different industries can be compared based on the Sigma-concept. The goal is to achieve a Six Sigma performance. Six Sigma means an average of defects of 2 ppm. Among different industries, the chip industry is clearly the champion, having achieved a Six Sigma performance. In case of the pharmaceutical industry, the manufacturing performance is estimated to be ca. two Sigmas. A Two Sigma performance means an average of 4.5% of defects. Thus the final quality testing is an important issue, that the patients receive top quality products. Thus, there is room for optimisation. The initiative will have a major impact on the development and manufacturing of new drugs. The focus is to build in the quality (quality by design and not by elimination of defective samples).

To optimise the quality performance it is a prerequisite to develop robust formulations and processes. Thus, there is a pressure to transform the Art of Formulation to a Science of Formulation, as in many cases formulation have been developed based on empirical knowledge and/or on the basis of “Trial and Error” – experiments (see Figure E. 2.1 Science Pyramid). Other issues are processes, which need to be better controlled. The PAT initiative has lead to a paradigm shift.

These developments will have an impact on the educations of industrial pharmacists, i.e. there is a need to strengthen the area of formulation and manufacturing science. As formulations are complex systems, there is a major challenge to study the behaviour of complex systems, as in the area of systems biology.

The event, planned on March 28, 2003 in Basel by FDA and the Pharmacenter together with the Swiss Society of Pharmaceutical Scientists, the Society of Industrial Pharmacists (GSIA), Novartis, Roche, Pfizer and Interpharma had to be cancelled due to the outbreak of the Iraqi War in 2003.

Invitation / Program

A Drug Quality System for the 21st Century and FDA's PAT Initiative

Presentations of J. Woodcock and A. Hussain
CDER, FDA, Rockville, SA

& Interactions with
Pharmaceutical Industry Representatives

Friday, 18, 2003

at the Pharmacenter University Basel, "Grosser Hörsaal"

- 08:30 Welcome and Introductory Remarks, Prof. Dr. H. Leuenberger, Pharmacenter
09:45 A Drug Quality System for the 21st Century by Dr. Janet Woodcock, Director,
CDER, FDA
10:00 FDA's PAT Initiative and its Role in the Proposed Drug Quality System for the
21st Century by Dr. Ajaz Hussain, Deputy Director, OPS, CDER, FDA
10:15 Process Analytical Technology in the Galenical Manufacturing at Roche, Dr.
Rolf Altermatt, Roche Basel, Galenical Bulk Operations – Quality Control
10:40 Process Analytical Technology at Novartis, Fritz Erni, Novartis Pharma,
Global Quality Operations
11:00 Panel Discussion, moderation: Prof. Dr. Hans Leuenberger
Participants: J. Woodcock, A. Hussain, N. Dunstan (Roche), S. Heir (Novartis)
J. van Koevinge (Roche), A. Rummelt (Novartis), J. Werani (Pfizer)

H.1.5 Installation of a sterile line at the IPL

The Industrial Pharmacy Lab IPL received as a gift from Novartis Pharma a used sterile line for the production of ampoules. This gift will be used for “hand-on” training of advanced students in the master program and within the framework of special practical courses. The PDA (International Association for Pharmaceutical Science and Technology) is interested in a cooperation with the IPL.

H.1.6 Research Agreements

- Ø Signing of a contract with DiPierro Ventures, Inc. New York, to develop a device for time controlled drug delivery. The project is coordinated by the WTT (Wissens- und Technologie-Transfer) office of the University of Basel and includes the Technical Universities of Basel and Solothurn as additional partners.
- Ø Signing of a contract with Phares Drug Delivery, Ltd., to investigate the solubilization and absorption of sparingly water soluble HIV inhibitors using lipid formulations. The contract involves financial support of post-doctoral fellow Dr. Susanne Kapitza.

H.1.7 Advanced activities in learning and teaching at Institute of Pharmaceutical Technology University of Basel

Project participants

Institute of Pharmaceutical Technology, University of Basel and Cybernetics department of Mendeleev University of Chemical Technology of Russia (MUCTR).



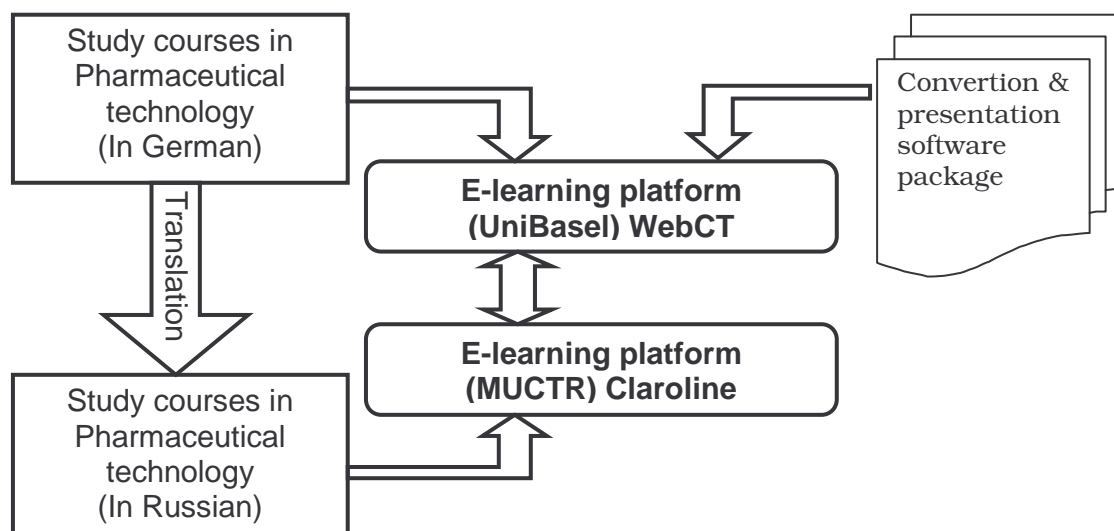
- Ø Institute of Pharmaceutical Technology (UniBasel)
- Ø Department of Cybernetics (MUCTR)
- Ø Faculty of Pharmaceutical technology (MUCTR)
- Ø Support of: URZ (UniBasel)
 Ressort Lehre "Learntech" (UniBasel)
 Swiss National Science Foundation

In brief the structure of the project is described on the following figure. The courses are developed at Institute of Pharmaceutical Technology as MS PowerPoint presentation in German. Those slides then converted by specially developed software packages into HTML format and implemented into Web-based E-learning platform (WebCT) available for the UniBasel campus.

After translation of the slides from German to Russian the slides are converted into HTML form and implemented into E-learning platform (Claroline) located at MUCTR Web-server for the students of the Faculty of Pharmacy.

By using special software packages developed at the Institute of Pharmaceutical Technology University of Basel the special version of the student handouts (gapped text) was prepared.

Project outline



Main tools of the E-learning platforms:

- Ø Learning management systems (LMS)
- Ø Content and authoring tools
- Ø Conversion tool
- Ø Quiz authoring tool

What is learning management system (LMS)?

- Ø Content organizing and correction tools
- Ø Syllabus management tool
- Ø Quiz management tool
- Ø Discussion and chat moderation
- Ø File management tool
- Ø Tracking students activity
- Ø Minimising the communication barrier between student and teacher
- Ø Guiding learning activity

Learning management systems (LMS) used in this project

- Ø WebCT (www.webct.com)
- Ø Powerful learning management system that installed at URZ of UniBasel. (<http://webct.urz.unibas.ch>)

Claroline (www.claroline.org) is free learning management system that was installed at MUCTR. This system was translated to Russian and now used to teach students of Faculty of Pharmacy at MUCTR. (<http://www.muctr.edu.ru/~cache/claroline/index.php>)

WEBCT ALLOWS:

- Ø Manage course content
- Ø Continually improve course and degree program quality
- Ø Answer frequently asked questions
- Ø Online and off-line communication
- Ø Fast and convenient exam preparation (see: Quiz authoring tool)

Courses at WebCT of UniBasel

- Ø Semisolid dosage forms
- Ø Solid dosage forms
- Ø Liquid-sterile dosage forms

QUIZ AUTHORIZING TOOL

Quiz authoring tool of WebCT allows creation of the following types of the questions:

- Ø Multiple choice
- Ø Simple answer
- Ø One choice from many
- Ø Calculation
- Ø Matching/sorting
- Ø Paragraph

Claroline e-learning platform

Claroline is the e-learning platform installed at MUCTR. This free software has the same main capabilities as the WebCT.

Claroline features

- | | | |
|----------------------|--------------------------|---------------|
| Ø Course description | Ø Links | Ø Groups |
| Ø File Manager | Ø Quiz (multiple choice) | Ø Assignments |
| Ø Agenda | Ø Forums | Ø Statistics |
| Ø Announcements | Ø Users management | Ø Help |

H.1.8 Diploma Studies

In the year 2003 7 students have completed their diploma work in the area of Pharmaceutical Technology. Diploma studies were performed in the Pharmacenter as well as in laboratories of partner institutions (see H.1.9, List of diploma thesis students, topics and location).

H.1.9 List of Diploma Students

with diploma thesis topics in Pharmaceutical Technology 2003

Student	Topic	Supervisor/Location
Aeppli Angela	Vergleich von Liposomenformulierungen zur kosmetischen Anwendung	Gabriele Betz Industrial Pharmacy Lab
Hausmann Gila	Niedrig dosierte Pulvermischungen	Dr. Stefan Kemmethmüller Novartis Animal Health
Meyer Andrea	Feuchtgranulation versus Direktverpressung	Gabriele Betz Industrial Pharmacy Lab
Schmid Florian	Optimierung der Lagerstabilität eines getrockneten Reaktionsgemisches auf Sensor-Streifen zur Bestimmung des Quick-Wertes	Charles Thürlemann Universität Bern, Asulab, Marin/NE
Schnyder Nathalie	Transdermale Iontophorese: Einfluss des Hautmetabolismus auf die Transportrate eines Dipeptids und eines Markers	Melanie Altenbach Pharmazentrum
Strasser Daniel	Untersuchung von Granulaten mittels Nahinfrarot-Spektroskopie	Frauke Russell F. Hoffmann-La Roche AG
Zimmermann Katja	Entwicklung einer oralen und nasalen flüssigen Midazolam Formulierung für die Pädiatrie	Verena Figueiredo Kantonsspital Basel

H. 2. Completion of the SCOPES 2000-2003 project in cooperation with MUCTR

H.2.1 Teaching/New Learning Technologies:

New education and multimedia courses for the Department of Pharmaceutical and Cosmetic Technology (MUCTR) were developed and introduced into curriculum.

Multimedia web-based education environment (web-portals) for the students of MUCTR and Institute of Pharmaceutical Technology, University of Basel was created, conceptually new model of education process, based on multimedia and web-based technologies in both Universities was introduced.

Five textbooks were published (two of them are in print now) and can be used for education of the students and PhD students.

Ph.D. student Denis Shishulin defended his thesis "Information-program environment for development of new technologies and drug dosage forms production flowsheet".

H.2.2 Research activity:

The following software were developed:

Multimedia- and web-based education environment (web-portals).

Intelligent system and rule-based expert system shell (CLIPS).

Decision-making support system for dosage form design is under developing.

Innovation technology and equipment for freeze drying in fluid bed at atmospheric pressure is developing.

The work "In vivo comparison of various liposomal formulations for cosmetic application" was completed and presented on the 5th Central European Symposium on Pharmaceutical Technology and Biotechnology, Ljubljana, Slovenia, September 2003.

As a consequence of the fruitful cooperation and the excellent results, there is a common desire to continue the project and to expand the activities especially in the field of Computational Science and Freeze-drying activity.

H. 3. Research

H.3.1 Publications 2003

A novel approach to the characterization of polar liquids. Part 3: Towards a better understanding of the parameter E_i/E . Publication, in english. Hernandez Perni Maria Engracia, Stengele Andrea, Leuenberger Hans, Special issue of Int.Journal of Pharmaceutics, (in press).

A novel approach to the characterization of polar liquids. Part 4: Broad band dielectric spectroscopy of polar binary mixtures. Publication, in english. Hernandez Perni Maria Engracia, Stengele Andrea, Leuenberger Hans, Special issue of Int.Journal of Pharmaceutics, (in press).

Aluminium in over –the-counter-drugs: Risks outweigh benefits? Publication, in english. Reinke Claudia, Breitschütz Jörg, Leuenberger Hans, *DrugSafety* 26 (14), 2003, 1011-1025. ISSN 0114-5916.

Batch and Continuous Processing in the Production of Pharmaceutical Granules. Publication, in english. Betz Gabriele, Junker Bürgin Pascale, Leuenberger Hans, *Pharm.Dev.Technol.* 8 (3), 2003, 289-297. ISSN 1083-7450.

Compression behaviour of the enzyme β -galactosidase and its mixture with microcrystalline cellulose. Publication, in english. Kuny Tanja, Leuenberger Hans, *Int.J.Pharm.* 260 (1), 2003, 137-147. ISSN 0378-5173.

Correlation of Membrane Order and Dynamics Derived from Time-Resolved Fluorescence Measurements with Solute Permeability. M.Sutter, T. Fiechter and G. Imanidis. *J. Pharm. Sci.* submitted (2003).

Effect of Surface Covering of Lactose Carrier Particles on Dry Powder Inhalation Properties of Salbutamol Sulfate. Publication, in english. Iida Kotaro, Hayakawa Youhei, Okamoto Hirokazu, Danjo Kazumi, Leuenberger Hans, *Chem.Pharm.Bull.* 51 (12), 2003, 1455-1457. ISSN 0009-2363.

Evaluation of Flow properties of Dry Powder Inhalation of Salbutamol Sulfate with Lactose Carrier. Publication, in japanese. Iida Kotaro, Hayakawa Youhei, Okamoto Hirokazu, Danjo Kazumi, Leuenberger Hans, *Pharm.Technol.Jpn* 19 (3), 2003, 39(359)-46(366). ISSN 0910-4739.

Granulation Process Control – Production of Pharmaceutical Granules: The classical batch concept and the problem of scale-up, Hans Leuenberger and Gabriele Betz, In: *Granulation and Coating of Powders*. Editors: Gabriel Tardos and Robert Pfeffer, (in preparation).

In Vitro Transdermal Iontophoretic Delivery of Leuprolide - Mechanisms under Constant Voltage Application. C. Kochhar and G. Imanidis. *J. Pharm. Sci.* 92:85-97 (2003).

In vivo comparison of various liposomal formulations for cosmetic application. Angela Aepli, Gabriele Betz, Nathalia Menshutina, Hans Leuenberger, in preparation, to be submitted to *International Journal of Pharmaceutics*.

In Vitro Transdermal Iontophoretic Delivery of Leuprolide under Constant Current Application. C. Kochhar and G. Imanidis. *J. Control. Release* submitted (2003).

Modeling of freeze drying process in fluidized bed spray dryer. A.E. Korneeva, M.N. Puchkov, A.A. Voynovskiy, N.V. Menshutina, H. Leuenberger. *Izvestiya Vuzov* (in Russian), 2003.

Multimedia education courses in the field of chemical technology and pharmaceutics. Applied software. N.V. Menshutina, H. Leuenberger, S.V. Goncharova, D.V. Shishulin, E.O. Lebedev, A.E. Korneeva. *Schoolbook*, 2003, 92 pp. (in print).

Non-destructive Dissolution Testing Correlation. Publication, in english. Kuny Tanja, Schatz Caspar, Ulmschneider Michel, Marrer Stephan, Leuenberger Hans, *Distech* 10 (1), 2003, 22-28. ISSN 1521-298X.

Permeation, Metabolism and Site of Action Concentration of Nicotinic Acid Derivatives in Human Skin - Correlation with Topical Pharmacological Effect. B. Müller, M. Kasper, C. Surber and G. Imanidis. *Eur. J. Pharm. Sci.* 20:181-195 (2003).

Physics of Particulate Matter. Pharmaceutical Powder Technology Handbook. H. Leuenberger and N. Menshutina, 2003, 120 pp. (In print).

Power consumption profile analysis and tensile strength measurements during moist agglomeration. Publication, in english. Betz Gabriele, Junker Bürgin Pascale, Leuenberger Hans, *Int.J.Pharm.* 252 (1.2), 2003, 11-25. ISSN 0378-5173.

Power Consumption Measurement and Temperature Recording during Granulation.
Gabriele Betz, Pascale Junker Bürgin, Hans Leuenberger. 2003. Int. J. Pharm., (in press).

Preparation of Dry Powder Inhalation by Surface Treatment of Lactose Carrier Particles.
Publication, in english. Iida Kotaro, Hayakawa Youhei, Okamoto Hirokazu, Danjo Kazumi,
Leuenberger Hans, Chem.Pharm.Bull. 51 (1), 2003, 1-5. ISSN 0009-2363.

Research Activities at the Institute of Pharmaceutical Technology of the University of Basel,
Proceedings, in english. Hans Leuenberger. Proc.Albi Intern.Rencontres Pharm.Eng. (2003).
Editors: Baron Michel, Dodds John, ISBN 2-9511591-2-9, Albi International Rencontres in
Pharmaceutical Engineering, École des Mines Albi-Carmaux; Albi 11.10.2001 - 11.10.2001.

**Scale-up in the 4th dimension in the field of granulation and drying or how to avoid classical
scale-up.** Publication, in english. Leuenberger Hans, Powder Technol. 130 (1.3), 2003, 225-230.
ISSN 032-5910.

H.3.2 List of Presentations as an Invited Speaker, Participation in Symposia, Workshops, Project/coordination Meetings, Organisation of workshops etc.

14.01.2003 to 15.01.2003, Sheffield, Leuenberger Hans	Invited Lecture, Granulation across the length scales: linking microscopic experiments and models to real process operation	Semi-Continuous Granulation - The Process of Choice for the production of Pharmaceutical Granules?
15.01.2003, Salt Lake City, Leuenberger Hans	Invited Lecture	Scale-up in the field of moist agglomeration and process analytical technology initiative of FDA
15.01.2003, Basel, Imanidis Georgios	Public lecture at the faculty of Natural Sciences of the University of Basel as part of the habilitation requirements	Quantitative Mechanistic Approaches in Drug Delivery Technology! A scientific discipline comes of age
21.01.2003, Basel, Dr. Maxim Puchkov	Seminars in the Industrial Pharmacy Lab of PhD students and invited talks	Advanced activities in learning and teaching at Institute of Pharmaceutical Technology
03.02.2003 to 07.02.2003, Karlsruhe, Puchkov Maxim	2003 Karlsruher Lerntechnologie-Messe	Advanced activities in learning and teaching at Institute of Pharmaceutical Technology, University of Basel
04.02.2003 to 05.02.2003, Binzen/Lörrach, Leuenberger Hans	No.61 Technology Training Center (TTC)- Workshop	Containment and Integrated Processing; Global trends in manufacture of solid dosage forms. Trends in Pharmaceutical Manufacturing - Challenges of the New Millennium
05.02.2003, Basel, Sutter Marc	Vorträge am Pharmazentrum - Seminars on Drug Discovery & Development	Correlation of Solute Permeability with Lipid Membrane Properties Derived from Time-Resolved Fluorescence Spectroscopy
09.02.2003 to 13.02.2003, Basel, Leuenberger Hans	Evaluationswoche Departement Pharmazie	Evaluation of the Pharmaceutical Sciences at the Swiss Federal Institute of Technology (ETH) Zürich & the University of Basel
11.02.2003 to 12.02.2003, Binzen/Lörrach, Leuenberger Hans	No.62 Technology Training Center (TTC)- Workshop, High Shear Processing	Granulation end point detection

18.02.2003, Basel, Graci Hernandez Perni	Seminars in the Industrial Pharmacy Lab of PhD students and invited talks	Dielectric Spectroscopy
05.03.2003 to 06.03.2003, Binzen/Lörrach, Leuenberger Hans	No. 64 Technology Training Center (TTC)- Workshop	Moderation of: High efficiency in research and development
21.03.2003, Basel, Leuenberger Hans, Imanidis Georgios	Transdermal Patch Meeting; Zusammenarbeit mit FH Nordwestschweiz	Presentation: Research Activities “Chronopatch”
25.03.2003 to 27.03.2003, Binzen/Lörrach, Leuenberger Hans	No.66 Technology Training Center (TTC)- Workshop Granulation & Tabletting	Presentation: In process moisture control and end point determination
28.04.2003, Basel, Leuenberger Hans	Lecture Pharmacenter	Presentation: Physikalisch- pharmazeutischer Rück- und Ausblick 2003
30.04.2003, Basel, Royston Jane	Vorträge am Pharmazentrum - Seminars on Drug Discovery & Development	From Science to Market: Levaraging 300 years of Scientific Excellence
06.05.2003, Basel, Michael Lanz, Johannes von Orelli	“Seminars in the Industrial Pharmacy Lab of PhD students and invited talks”	Tablet machine instrumentation
07.05.2003, Albi CT Cedex, Leuenberger Hans	École des Mines Albi-Carmaux. Membre du jury de la Habilitation de Dr OULAHNA Driss. Invited Member of the board	Habilitation de Dr. D. Oulahna
13.-14.05.2003, Würzburg, Gabriele Betz	Invited Talk, Modified Release Seminar	Application of percolation theory for the development of robust matrix-type controlled drug release systems
17.05.2003 to 22.05.2003, Hollywood USA. Leuenberger Hans	15 th CAETS Council Meeting CAETS Council Meeting Report	Member of Swiss delegation of the Swiss Academy of Engineering Sciences SATW
22.05.2003, Basel, G. Betz and A. Guntermann on behalf of H. Leuenberger	Thai Delegation, “The Industrial Pharmacy Group”	Presentation with the Title “Research at the Institute of Pharmaceutical Technology” and guided tour in the Industrial Pharmacy Lab

25.05.2003 to 27.05.2003, Illkirch Cedex, Puchkov Maxim, Chairman of Session	IX International Workshop on Bioencapsulation, State of Art of Bio&Encapsulation Science and Technology- Session Process Modeling & Simulation	Modeling environment for drying process design
03.06.2003, Basel, Caroline Sautter	Seminars in the Industrial Pharmacy Lab of PhD students and invited talks	Sustained release injectables formed in situ for veterinary use
04.06.2003, Basel, Lenz Corinna	Vorträge am Pharmazentrum - Seminars on Drug Discovery & Development	Untersuchungen zur Herstellung von Pellets in der Rotorwirbelschicht unter bes. Berücksichtigung der Prozessüberwachung mittels Leistungsaufnahme
09.06.2003 to 10.06.2003, Seville, Leuenberger Hans	Special Lectures, Development of Controlled Drug Release Systems. University of Sevilla, Spain	Development of Controlled Drug Release Systems
24.06.2003, Albi CT Cedex, Leuenberger Hans	École des Mines Albi-Carmaux, Conseil Scientifique de l'École des Mines d'Albi-Carmaux. Invited participant of the Meeting.	Meeting of the Scientific Advisory Board
25.06.2003, Basel, Kuny Tanja	Vorträge am Pharmazentrum - Seminars on Drug Discovery & Development	Compression behaviour of the enzyme β -galactosidase
05.07.2003 to 11.07.2003, Basel, Menshutina N. V., MUCTR	Visit related to: SCOPES Progr.7IP 062613 & New courses and work in Computational Science and Pharm Education & Projectframe INTAS	
08.07.2003, Basel, Hedinn Valporsson	Seminars in the Industrial Pharmacy Lab of PhD students and invited talks	FDA's PAT Initiative
18.07.2003, Basel, Leuenberger Hans	Meristem-Project Events	Selection of Drying Process and Development of Dosage Form for recombinant protein
13.08.2003, Basel, Hans Leuenberger on behalf of Jürgen Werani, Pfizer GmbH Arzneimittelwerk Gödecke	NDS-Program: Strategies and Trends in Pharmaceutical Development and Production (vgl. D.2.1).	From a new chemical entity to a marketed product - the development process as a part of the value creation chain

21.08.2003, Gabriele Betz	NDS–Program: Strategies and trends in pharmaceutical development and production, Continuing Education Course of the Center of Pharmaceutical Sciences Basel-Zurich	Scale-up of the tableting process with MCC Presster TM
01.09. to 05.09.2003, Basel, G. Betz and M. Puchkov on behalf of H. Leuenberger	Visit at the Pharmacenter. Invitation of a Russian Scientists Delegation with Vice Minister of Industry, Science and Technology Mikhail Kirpichnikov to Switzerland in the field of Biotechnology and Nanoscience	Presentation with the Title “Research at the Institute of Pharmaceutical Technology” and guided tour in the Industrial Pharmacy Lab
7.9. to 10.9.2003 Innsbruck, Imanidis Georgios	Plenary lecture at the 7 th International Conference on Pharmacy and Applied Physical Chemistry	Advances in the Science of (Trans)-Dermal Drug Delivery
15.09.2003, Salt Lake City, Leuenberger Hans	Invited Lecture at the University of Utah, Salt Lake City	A novel approach to the characterization of polar liquids
25.09.2003 to 27.09.2003, Ljubljana, Leuenberger Hans	5 th Central European Symposium on Pharmaceutical Technology and Biotechnology	A novel approach to the characterization of polar liquids. Investigation of the influence of process and formulation design on power consumption measurement during wet agglomeration
25.09.2003 to 27.09.2003, Ljubljana, Gabriele Betz	5 th Central European Symposium on Pharmaceutical Technology and Biotechnology	In vivo comparison of various liposomal formulations for cosmetic application (Angela Aepli, Gabriele Betz, Natalia Menshutina, Hans Leuenberger).
23.10.2003, Vienna, Betz Gabriele, on behalf of H.Leuenberger	2003 ECA Pharmaceutical Facilities meeting, Solida Technology	Application of Percolation Theory for the Development of Robust Formulations
23.10 - 24.10. 2003, Paris, G. Imanidis, D. Hummel and S. Reutlinger	Poster at the Skin and Formulation Symposium	Phase structure of O/W Dermal Formulations and its Influence on Transdermal Drug Permeation
23.10 - 24.10. 2003, Paris, M.P. Altenbach and G. Imanidis	Poster at the Skin and Formulation Symposium	Effect of Metabolism of a Dipeptide on Iontophoretic Enhancement

24.10.2003, Baden, Leuenberger Hans	CASS-Klausurtagung 2003	Thema: Beiträge zum Fortschritt auf dem Wege zu einem nachhaltigen Energiesystem
26.10 - 30.10. 2003, Salt Lake City, UT, T. Tassopoulos, H. Vuong, C. Pellanda, G. Imanidis, V. Figueiredo, E.W. Smith C. Surber	Poster at the AAPS Annual Meeting and Exposition	Topical Bioavailability of Sunscreen Agents in Stratum Corneum: Effect of Vehicle and Time
26.10 - 30.10. 2003, Salt Lake City, UT, C. Pellanda, V. Figueiredo, T. Tassopoulos, C. Purdon, G. Imanidis, E.W. Smith C. Surber	Poster at the AAPS Annual Meeting and Exposition	In Vivo Quantification of Triamcinolone Acetonide in Stratum Corneum
31.10.2003, Basel Leuenberger Hans, Kessler Michael	2003 Neuzeit? Ein Abend im Haus zum Vorderen Sessel. Organisation: Forum cogito ergo sum of the University of Basel.	Elektronischer Datenaustausch, Hyperkommunikation, der Informations-Highway. Das Ende der Welt, wie wir sie aus dem 20.Jh. noch kannten - die Globalisierung von System und Kultur.
04.11.2003, Basel, Lars Sukowski	Seminars in the Industrial Pharmacy Lab of PhD students and invited talks	NIR Based Process Analytical Technology (PAT): In-line Residual Moisture Determination for a Complete Batch Inspection of Lyophilized End-Products
17. to 18.11. 2003 Basel, Imanidis Georgios	Lecture at the Pentapharm Company Seminar	Penetration and Permeation of Actives in the Skin
20.11.2003, Moscow, Leuenberger Hans	Invited Member of the board, participating at the PhD-Defence of D.Shishulin	In the framework of the cooperation with MUCTR
27.11.2003, Basel	2003 Diplomfeier, Organisation der Diplomfeier im Rathaussaal, Gastreferent Dr. Jürg Meier, Novartis International	Thema Gastreferat: Sind Apothekerinnen und Apotheker geborene Unternehmer?
08.12.03 to 11.12.2003, Freiburg i.Br. Guntermann Anja	2 nd Pfizer Global PPD Meeting Innovative Technologies – Presster™. Poster Presentation	In the framework of the cooperation with Pfizer

17.12.2003, Basel, Dodds John	Vorträge am Pharmazentrum - Seminars on Drug Discovery & Development	Can solids formulation be a science?
17.12.2003, Basel, Leuenberger Hans	Cooperation with l'École des Mines d'Albi-Carmaux in the area of pharmacy.	Study project
18.12.2003, Basel, Michel Baron	Seminars in the Industrial Pharmacy Lab of PhD students and invited talks	Pharmaingenieur, Education program of "École des Mines", Albi France
18.12.2003, Basel, Leuenberger Hans	Cooperation with FHBB in the area of "Pharma-Ing."	Study project

H.3.3 Visiting scientists

June – July 2003	Cooperation with Bosnalijek, Sarajevo, Bosnia-Herzegovina, Visiting scientist Haris Trobradovic	Project "Application of Differential Scanning Calorimetry (DSC) to Stability Studies of Avamigran Film Tablet".
July 2003 – February 2004	Cooperation with Mahidol University, Prof. Ampol, Visiting Scientist Krisanin Chansanroj	Project "The application of hot melt coating technique to the controlled release formulation."
September 2003- August 2004	Cooperation with Shionogi, Japan, Visiting scientist Go Kimura	Project "Effect of porosity on dissolution and tableting of fluid granules containing mefenamic acid"
March 2002 – March 2003	Dr. Hiroshi Tanaka, on sabbatical leave from Shionogi Co. & Ltd., Osaka, Japan.	Project work at the Industrial Pharmacy Laboratory: "Solid dispersions for low water soluble drugs."

H.3.4 List of PhD-Theses in Pharmaceutical Technology completed in 2003

PhD student	Title	Funding/Location
Krabichler Michaela	The preventive effect of α -tocopherol on UVA/B-induced p53-gene photodamage in human skin fibroblasts	F. Hoffmann-La Roche AG
Lenz Corinna	Suche nach kritischen Konzentrationen bei der Herstellung von Pellets in der Rotor-wirbelschicht	Spirig Pharma AG
Sutter Marc	Physiochemical Properties of Lipid Bilayer Membranes Derived from Time-Resolved Fluorescence Spectroscopy: Relevance for Solute Permeability	Institute of Pharmaceutical Technology, University of Basel
Sukowski Lars	Online Near-Infrared Spectroscopy: Noninvasive Determination of Residual Moisture in Entire Batches of Lyophilized Pharmaceutical Products	Institute of Pharmaceutical Technology, University of Basel F. Hoffmann-La Roche AG
Schröder Verena	Role of blood coagulation factor XIII in vascular diseases and characterisation of genetic variants	Insel-Spital Bern

I. Outlook 2003

I. 1. On-Going Research Activities

I.1.1 PhD-Students

PhD Student	Topic (Working Title)	Funding and Location
Altenbach Melanie	Transdermale Iontophorese von geladenen und ungeladenen Verbindungen: Einfluss der Molekülladung und der Moleküllipophilie auf den Transport durch menschliche	Institute of Pharmaceutical Technology, University of Basel
Bausch Ursula Johanna	Steriles Abfüllen von Lösungen mit Zellen	Alphacos SA, CH 2822 Courroux; Institute of Pharmaceutical Technology, University of Basel
Blaser David	Wirkstoffabsorption mit Caco-2 Zellkulturen	Institute of Pharmaceutical Technology, University of Basel
Egger-Heigold Barbara	The effect of excipients commonly used for drug formulation on the blood distribution.	Novartis Pharma AG
Faatz Susan	Ländervergleich Irland-Schweiz betreffend der Rahmenbedingungen für die Pharmazeutische Industrie	Private source
Fueg Lise-Marie	Einblick in die Entwicklung von Pulvern zur Inhalation mit dem SkyePharma multidose Dry Powder Inhaler (mDPI)	Skye Pharma AG, MuttENZ
Guntermann Anja	Scale-up of tablet formulations using the Presster™ equipment	Pfizer GmbH, Arzneimittelwerk Gödecke, Freiburg i.Br.; Institute of Pharmaceutical Technology, Industrial Pharmacy Lab, Basel
Hernandez Perni Maria Engracia	Dielectric Spectroscopy of hydrophilic solutions	Institute of Pharmaceutical Technology, University of Basel
Kimura Go	Effect of porosity on dissolution and tableting of granules containing Mefenamic acid	Institute of Pharmaceutical Technology, Industrial Pharmacy Lab, Basel

Kuny Tanja	Untersuchungen zur Trockenagglomeration von pharmazeutischen Wirk- und Hilfsstoffen	Institute of Pharmaceutical Technology, University of Basel
Lanz Michael	The behavior of disordered particulate systems in case of dry and moist agglomeration processes	Swiss National Science Foundation, Bern, Grant No 20-58941.99; Institute of Pharmaceutical Technology; Basel
Lema Carmen	NIR based process analytical technology: in-line residual moisture determination for a complete batch inspection of lyophilized end-products	F. Hoffmann -La Roche AG, Basel
Nalenz Heiko	Einfluss der Struktur mehrphasiger topischer Formulierungen auf die Absorption	Institute of Pharmaceutical Technology, University of Basel
Plitzko Matthias	The production of nanocomposites using the spray-freeze-drying technique	NCCR (National Center of Competence in Research) Nano-Center, Basel; Glatt GmbH Binzen Institute of Pharmaceutical Technology, University of Basel
Rehorik Lars	Process modeling as a tool to indicate quality aspects in the pharmaceutical production	F. Hoffmann -La Roche AG, Basel
Reitbauer Susanne	Absorption paths of drugs through CaCo-2 cells	Institute of Pharmaceutical Technology, University of Basel
Russell Frauke	Near-infrared Transmission Spectroscopy – a fast and non-destructive method for dissolution testing of solid dosage forms	F. Hoffmann -La Roche AG, Basel
Sautter Caroline	Slow release of veterinary formulations	Novartis Animal Health AG, Basel
Schiffmann Axel	CIP-Systeme bei der Wirbelschicht Granulierung	Glatt GmbH, Binzen, D
Tassopoulos Tatiana	Evaluation of topical bioavailability of MBC in human stratum corneum by tape stripping using a direct spectroscopic method	Institute of Hospital Pharmacy, University Hospital Basel
Thürlemann Charles	Development of a Biosensor-System for self-testing the intensity of anticoagulation by anticoagulated patients in capillary whole blood	Insel-Spital, Bern, Asulab, Marin/NE

Valporsson Hedinn	PAT and new Strategies in the pharmaceutical production and their economical impact	Novartis Pharma Stein AG, Stein
von Orelli Johannes	Expert Systems zur Entwicklung von Tabletten und Kapsel­formulierungen - Development of an expert system for solid dosage forms	Institute of Pharmaceutical Technology, University of Basel
Walter Marijke	Konzeption, Entwicklung und Realisierung eines vernetzten e-Lehr- und-Lernprogrammes der Pharm.Technologie	Private source

I.1.2 Postdoctoral Positions

Dr. Betz Gabriele	Implementation of Research and Teaching in the Industrial Pharmacy Laboratory Mülhauserstrasse 49/51	Institute of Pharmaceutical Technology, University of Basel
Dr. Puchkov Maxim	New Learning and Teaching Technologies and expert systems, Industrial Pharmacy Laboratory	IT specialist for Expert Systems and Computational Science. On leave from MUCTR (cooperation project)
Dr. Kapitza Susanne	Solubilization of poorly water-soluble compounds	Institute of Pharmaceutical Technology, University of Basel

I. 2. Grants and Operating Budget

I.2.1 Contribution of the University (figures 2002 costs - 2003 budget):

2002	(running costs):	CHF	105 115	
	(investment in equipment):	CHF	155 674	(incl. CHF 20 000 for EDV)
2003	Budget: (running costs)	CHF	77 500	
	Budget: (investment in equip.)	CHF	81 505	(incl. CHF 18 205 for EDV)

I.2.2 External funding administered by the University

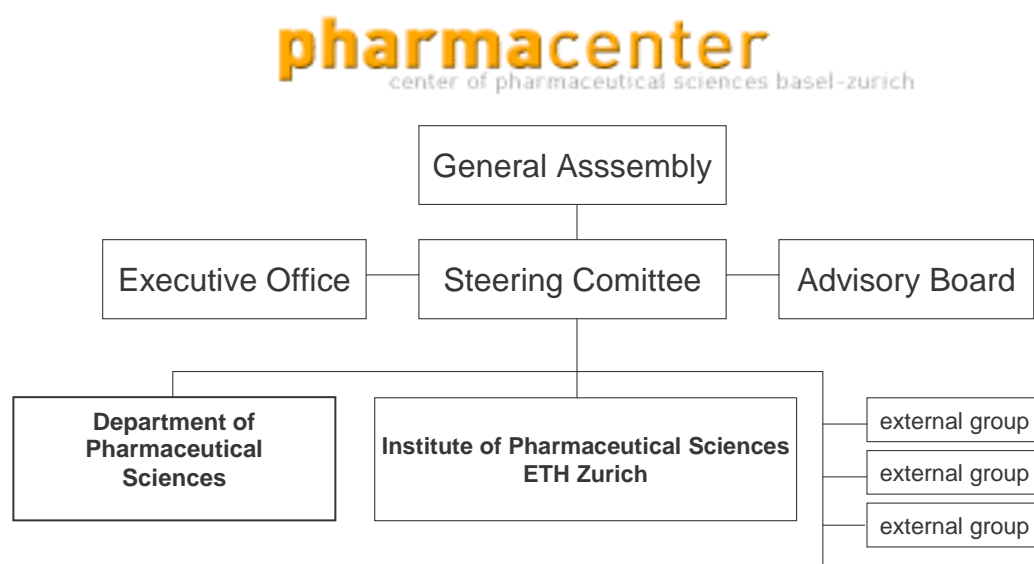
External funding administered by the University incl. Swiss National Science Foundation (SNF):
CHF 169 339 (2001-2003).

I.2.3 Other third party money not administered by the University

Direct payments to PhD students	CHF	420 000	(estimate ± 20%)
(individ. and SNF salaries):			

ATTACHMENT

J. Organization charts



Organization
www.pharmacenter.ch

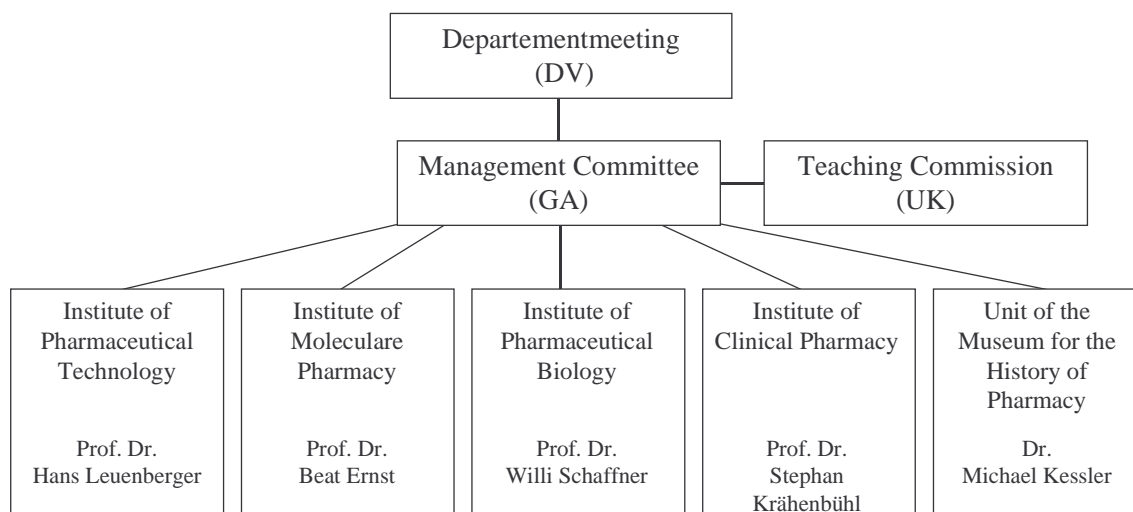
Steering Committee Members 2003

- Ø G. Folkers, President
- Ø H. Wunderli (ETH)
- Ø H. Leuenberger
- Ø A. Eberle (external groups)

Executive Office

- Ø H.P. Wessels, Managing Director

Organization Department of Pharmaceutical Sciences



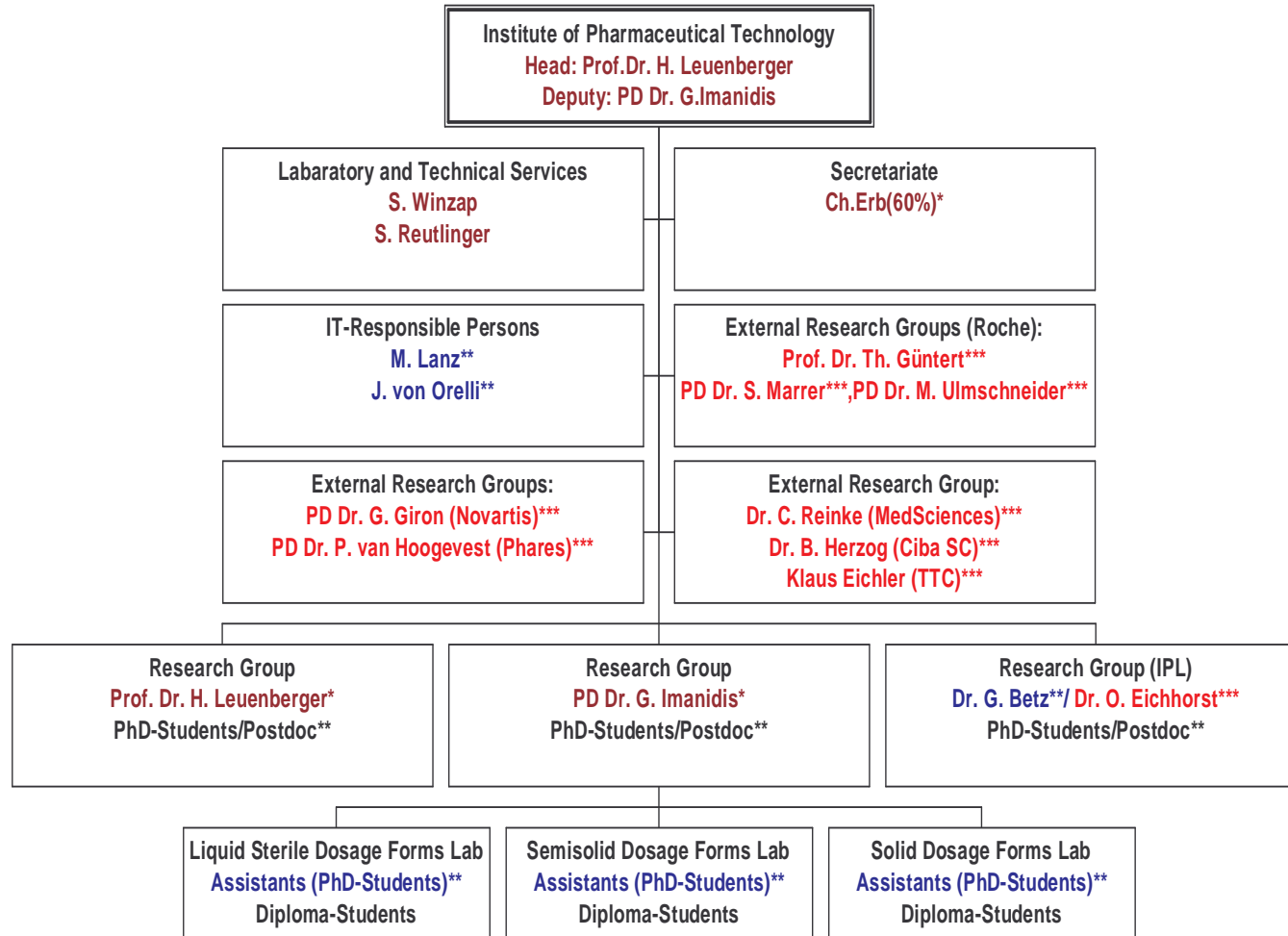
Management Committee 2003

- Ø H. Leuenberger (Vorsitz)
- Ø B. Ernst
- Ø W. Schaffner
- Ø J. Krähenbühl

Teaching Commission

- Ø B. Ernst (Vorsitz)

Organisational Chart Institute of Pharmaceutical Technology



***Employees of the University**

****PhD/Postdoc students**

non-permanent positions, support by University, SNF, private grants etc.

*****External docents**

not employees of the University

K. Reports / Contributions from External Docents

K. 1. PD Dr. D. Giron

K.1.1 Activities

Symposium organization/scientific committee

- Ø As President of STK: Joint meeting STK-AFCAT , Mulhouse, 19-22.05.03
- Ø As President of STK: STK day Vers-chez-les Blanc, 5 .11.03
- Ø As Science and Technology (S&T) Forum member at Novartis: S&T day at Novartis, 26.09.03. Basel

Lectures

May 2003	STK-AFCAT Meeting	S. Garnier, M. Mutz and D. Giron, Study of crystallization of drug substances under solvent vapour atmospheres by microcalorimetry
August 2003	Strategies and trends in pharmaceutical development and production, organised by ETH and Basel pharmaceutical Institute, Basel	Analytical development for active ingredients, salt form, polymorphism, stability, impurities
September 2003	Plenary lecture, PhanTA7, Innsbruck	The solid State of Pharmaceutical Compounds. Impact of the ICH Q6 Guideline on Industrial development
September 2003	PhanTA7, Innsbruck	Fast Polymorph screening and Data Analysis by a new High Throuput X-ray Powder Diffraction Instrument. Example of an Active Ingredient which has the tendency to form solvates

Workshops, lectures at university

June 2003	Pharmaceutical University of Nancy	Le rôle de l'analytique dans le développement pharmaceutique des nouvelles substances actives
3Q2003	Pharmaceutical Institut Basel, Wahlpraktikum	Thermische Analyse
4.12.03	Chemical and Physical Institut (CPE), Lyon, Formation continue	Analyse thermique appliquée à la pharmacie

K.1.2 Publications

- Ø D. Giron, "Monitoring of polymorphism, from detection to quantification", Engineering in Life Sciences, (2003), 3, 103-112.
- Ø D.Giron, "Thermal Analysis and Calorimetric techniques for the characterization of solid phases in pharmaceutical field", Spectra Analyse (2003), 32, 17-25.
- Ø D.Giron, "Characterisation of salts of drug substances", J. Therm. Anal. Calorim., (2003), 73, 441-457

Posters

- Ø D. Giron, M. Bellus, S. Garnier, C. Goldbronn, P. Piéchon and S. Pfeffer, "Use of thermoanalytical combined techniques for process development" JCAT34, May 2003, Mulhouse
- Ø S. Garnier, D. Giron, M. Mutz, "Study of crystallization of drug substances under solvent vapour atmosphere by microcalorimetry", PhanTA7, Innsbruck, Sept.03

K. 2. T.W. Guentert

In addition to the lectures in Biopharmaceutics, Drug Metabolism and Instrumental Analysis, extensive restructuring took place to achieve a higher degree of coordination within the Pharmacy curriculum.

Dissertations

Ongoing Dissertations:

- Ø Susan Grange, University Basel Pharmacokinetic-pharmacodynamic modeling as a tool to extrapolate dose-effect relationships from animal to man. (Beginning 1996)
- Ø Shiva Neysari, University Basel Characterization of the functional coupling and binding mode of Neuropeptide-Tyrosine (NPY) Y2 and Y5 receptors: Implications for their functional role. (Beginning 2000)

Completed Dissertation:

- Ø Stefanie Lerch, University Bern Ifosfamidtherapie assoziierte Enzephalopathie und ihre Interaktion mit Benzodiazepinrezeptoren
- Ø Olivier Luttringer, University Basel Physiologically-based Modeling of Active Transport Processes.

Publications / Abstracts

- Ø F.-P. Theil, T.W. Guentert, S. Haddad, P. Poulin: Utility of physiologically - based pharmacokinetic models to drug development and rational drug discovery candidate selection. Toxicology Letters 138 29-49, 2003
- Ø O. Luttringer, T. Lavé, P. Poulin, T.W. Guentert: Physiologically-based pharmacokinetic (PBPK) modeling of disposition of Epiroprim in humans. J. Pharm. Sci. 92, (10), 1990-2007, 2003

K.2.1 Invited Speaker

September 29, 2003	ECPM Course “The Future of Drug Development” Predictive Models – Key to High Chance of Success. University Hospital, Basel	
Dec 1-5, 2003, Honolulu, Hawaii	2nd International Drug Discovery & Development Summit: “Novel Concepts and Technologies to Accelerate Drug Development”,	Importance of Assessing Drug-Drug Interactions – A Pharmaceutical Industry Point of View

K.2.2 External Courses

- Ø Faculty Member in Workshop in Basic Pharmacokinetics, Dept. of Pharmacy, Univ. Manchester: Arosa July, 6 – 11, 2003

K.2.3 Research 2003

- Ø In vitro absorption models
- Ø Influence of galenical factors on drug absorption
- Ø Prediction of drug behavior in humans based on animal and in vitro data
- Ø Simulation techniques
- Ø Pharmacogenomics

K. 3. Dr. Bernd Herzog

Ciba Specialty Chemicals G-9001.2.28

PO Box 1266

D-79630 Grenzach-Wyhlen

K.3.1 Ehrung

- Ø Ernennung zum “Research Fellow” of Ciba Specialty Chemicals (am 13.11.03) als Anerkennung für herausragende Leistungen und Kompetenz in der Forschung.

K.3.2 Publikationen 2003

- Ø “Sun Protection beyond the Sun Protection Factor - New Efficient and Photostable UVA-Filters”, U. Osterwalder, H. Luther, B. Herzog, in: „Sun Protection“, Verlag für chemische Industrie (H. Ziolkowski GmbH), Augsburg 2003
- Ø “BEMT: An Efficient Broad-Spectrum UV Filter”, S. Mongiat, B. Herzog, C. Deshayes, P. König, U. Osterwalder, *Cosmetics & Toiletries* **118**, 47 – 50, 52, 54 (2003)

- Ø “The Sunscreen Simulator: A Formulator’s Tool to Predict SPF and UVA Parameters”; B. Herzog, C. Mendrok, S. Mongiat, S. Müller, U. Osterwalder; Int. Conference Proceedings, Sun Protection: A Time of Change, 2003, The Royal Academy, London
- Ø “Aggregation of a Pseudoisocyanine Chloride in Aqueous NaCl Solution”, B. Herzog, K. Huber, H. Stegemeyer, *Langmuir* **19**, 5223 – 5232 (2003)
- Ø “The Sunscreen Simulator: A Formulator’s Tool to Predict SPF and UVA Parameters”; B. Herzog, C. Mendrok, S. Mongiat, S. Müller, U. Osterwalder; *SÖFW Journal* **129**, 25, 26, 28, 30, 31, 34 – 36 (2003)

K.3.3 Vorträge 2003

- Ø “The Sunscreen Simulator: A Formulator’s Tool to Predict SPF and UVA Parameters”; B. Herzog, C. Mendrok, S. Mongiat, S. Müller, U. Osterwalder; Sun Protection: A Time of Change, 2003, The Royal Academy, London (oral presentation)

K. 4. PD Dr. Peter van Hoogevest

In Zusammenarbeit mit der Firma Phares Drug Delivery AG (MuttENZ) und der Fachhochschule Beider Basler (Prof D. Gygax) wurde ein Post-Doc Projekt am 1.10.2003 initiiert. Aufgabe des Post Docs (Frau Dr. S. Kapitza) ist es Phospholipide als Solubilisatoren für lipophile Wirksubstanzen in CaCo2 Zellkulturen zu etablieren.

K.4.1 Vortrag

- Ø Versailles, France (2003), 1st EUFEPS Conference on Optimising Drug Delivery and Formulation: Vortragstitel: New Challenges in Drug Delivery, Seminar: Accelerating the pharmaceutical development of poorly soluble compounds

K. 5. PD Dr. Stephan Marrer

K.5.1 Contribution by External Docents

PD Stephan Marrer. PhD, responsible for Organizational Development at Roche Basel, is teaching Quality Management Topics. His scientific oeuvre submitted to the Faculty of Natural Science was accepted, he became Private Docent (PD) at the University of Basel in 2002. He is supervising the PhD thesis of Lars Rehorik.

K.5.2 Contributions to research and teaching

Ø PD Stephan Marrer, PhD, responsible for Organizational Development at Roche Basel is teaching Quality Management topics.

In 2003 the lecture “Quality Management in der pharmazeutischen Praxis” was held the first time as interactive joint lecture at the Department of Pharmaceutical Sciences, University Basel, and Institute of Pharmaceutical Sciences, Swiss Federal Institute of Technology Zürich using the Telepoly infrastructure. This joint lecture is strengthening the function of the Center of Pharmaceutical Sciences Basel-Zürich.

The operating costs for the Telepoly infrastructure was sponsored by F. Hoffmann-La Roche Ltd.

K. 6. Dr. Claudia Reinke

K.6.1 Investigation of the influence of antioxidative vitamins (vitamin E and C) on UV-irradiated human skin fibroblasts

The PhD research work of Michaela Krabichler, “The preventive effect of α -tocopherol on UVA/B-induced p53-gene photodamage in human skin fibroblasts” was successfully completed in 2003. The PhD- committee (Prof. Dr. Hans Leuenberger, Dr. C. Reinke, Dr. Willi Hunziker) acknowledges the support given by F. Hoffmann-La Roche, Vitamins and especially the team Dr. Jochen Klock and Dr. Elisabeth Stöcklin, accompanying Michaela Krabichler.

K.6.2 Publication

In 2003 an important review paper on the risks of Aluminium in over-the-counter-drugs was published (see H.3.1): **Aluminium in over-the-counter-drugs: Risks outweigh benefits?** Publication, in english. Reinke Claudia, Breitkreutz Jörg, Leuenberger Hans, *DrugSafety* 26 (14), 2003, 1011-1025. ISSN 0114-5916.

ACKNOWLEDGEMENTS

All the persons especially the external docents and the companies/institutions, who have supported research and teaching at the Institute of Pharmaceutical Technology are officially acknowledged.

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Basel, February 20, 2004

Prof. Dr. H. Leuenberger