

# Informal science laboratories as part of IBSE



PD Dr. Skiebe-Corrette, 2.10.2009

Science Education in School focused on inquiry-based science education



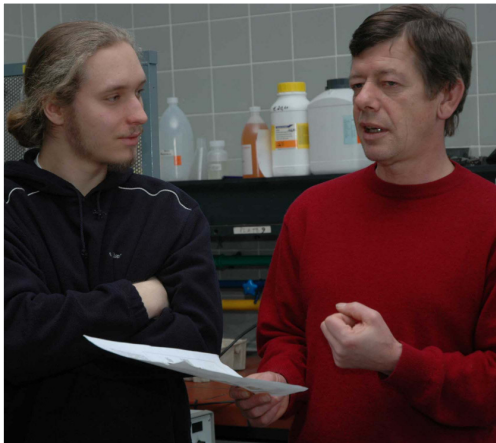
## 1. Informal Science Laboratories:

- What is an informal science laboratory?
- Where are informal science laboratories located?
- Why were informal science laboratories founded?

## 2. NatLab:

- Center for post-service teacher training
- Laboratory where school students do hands-on experiments
- Center for pre-service teacher training





## What is an informal science laboratory?

- Laboratory where school students perform experiments
- Mostly as complete classes
- Duration: ½ day or longer
- Topics: **Biology**, **Chemistry**, Physics, Technology
- Topics related to the research of the institute **and**/or related to the school curriculum
- Often contact with scientists or university students



# Where are informal science laboratories located?



Hillebrandt & Dähnhard (IPN)

Associated with industry: 90's

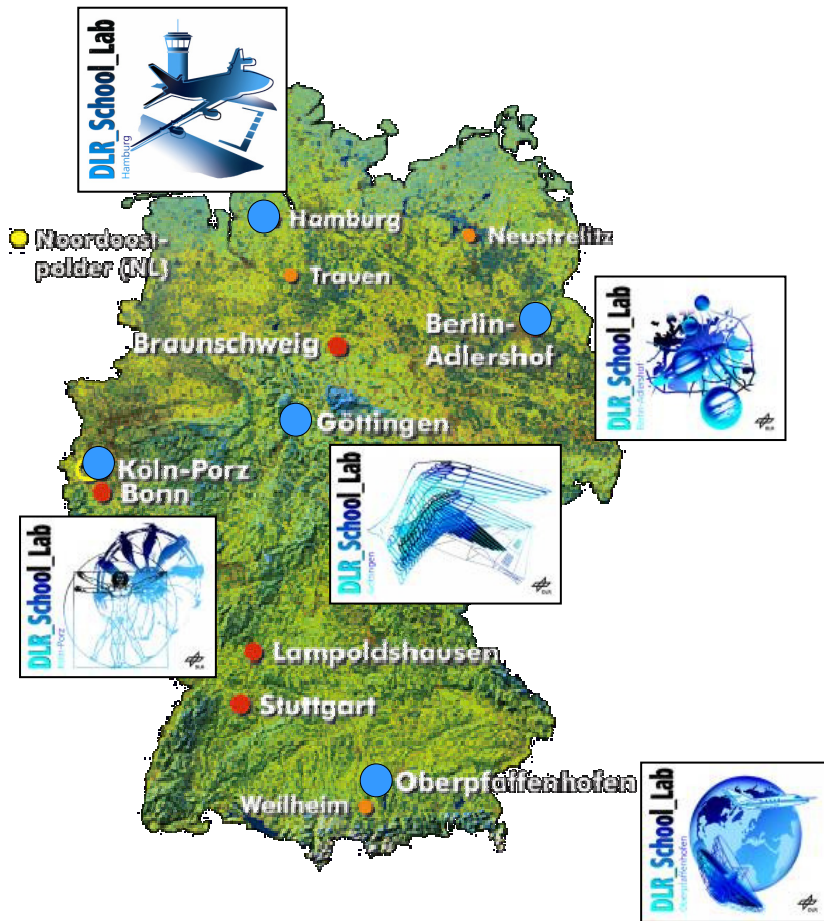


<http://www.rheinneckarweb.de/basf/youngcorner/lehrer/labor/schuelerlabor/>

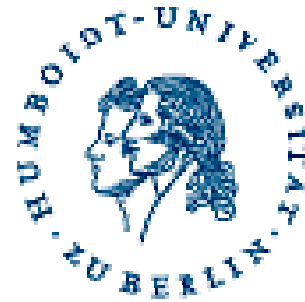


# Where are informal science laboratories located?

large research centers  
e.g. DLR\_School\_Labs



## Universities



# Why were informal science laboratories founded?

- Difficulties in finding qualified employees (students, scientists, trainees)
- Increase the interest in science
- Introduce a realistic and modern picture of science
- Contribute to science education
- Centers of pre- and post-service teacher training
- Centers for research on teaching and learning
- Publicity



## 4 Target groups



- Scientists
- Teachers
- Pupils (primary and secondary schools)
- Student Teachers

Place where all these groups interact



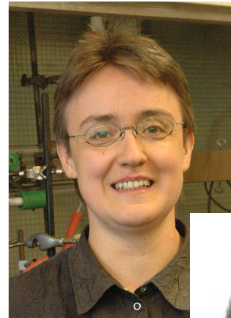
# Das NatLab-Team is large



**Prof. Mutzel**



**PD Dr. Dobelhofer**



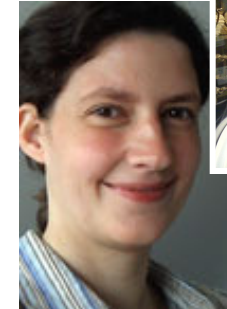
**Prof. Schlecht**



**Dr. Mohr**



**Prof. Schalley**



**Dr. Steinmetz**



**Dr. Graf**



**PD Dr. Donner**



**Prof. Haag**



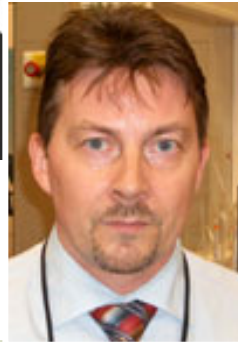
**Prof. Menzel**



**Prof. Abram**



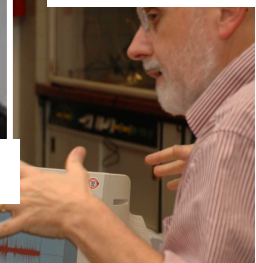
**Prof. Roth**



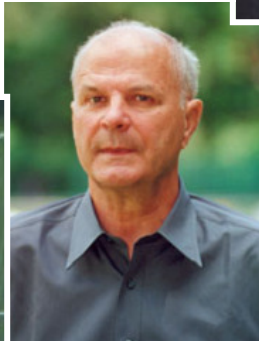
**Prof. Beckmann**



**Prof. Beckmann**



**Dr. Corrette**



**Prof. Seppelt**



**Prof. Hilger**

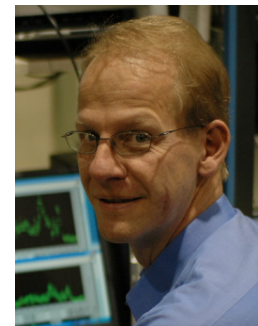
**Herr Goerlich**



**Dr. Haschke**



**Prof. Schönfelder**



**Prof. Rühl**



**Prof. Hartmann**



**Prof. Krüger**

# NatLab: Post-service teacher training

enable teachers to prepare and review the visit

Theoretical and practical training by scientists  
(4 – 8 hours)





# NatLab: Visit provides pupils with **a bridge to the university**

**Pupils** perform hands-on experiments with **pre-service teachers** and **scientists**





# NatLab: Visit provides pupils with **a bridge to the university**

**Pupils** present their data in a lecture as part of their inquiry



# NatLab: Pre-service training for teachers

- Increase the time pre-service teachers spend
  - working with the pupils
  - developing teaching material
- Increase their experience in doing hands-on experiments themselves



# NatLab: **Pre-service training for teachers**

- Being close to pupils
- Knowledge about the range of capabilities of pupils
- Small group of pupils
- Reduction of anxiety for difficult teacher student situations
- Early chance to re-think their career choice
- Focus on the method of teaching not on the factual knowledge
- Deepening of the factual knowledge through the questioning of the pupils
- Test their pedagogical skills





BIOLOGIE	Experimentzyklen	Methoden
<b>Lebensprozesse bei Pflanzen</b> (11. Jahrgang) oder <b>Ökologie und Umweltschutz</b> (12. Jahrgang, 2.Sem)	<b>Ökophysiologie der Fotosynthese: C<sub>3</sub>- und C<sub>4</sub>-Pflanzen</b> 1. Messung der Lichtabhängigkeit der Fotosynthese anhand der photosynthetischen O <sub>2</sub> -Freisetzung (Prof. Hartmann) 2. Messung der Lichtabhängigkeit der Fotosynthese anhand des photosynthetischen CO <sub>2</sub> -Verbrauchs (Prof. Hartmann) 3. Messung der Aufnahme von H <sub>2</sub> O durch Pflanzen (Prof. Hartmann) 4. Histochemie: Nachweis des nichtzyklischen Elektronentransports und von assimilatorischer Stärke (Dr. Haschke)	- O <sub>2</sub> - und CO <sub>2</sub> -Messungen - Messung des transpiratorischen Wasserverlusts - computergestützte Messwertaufzeichnung und -auswertung - Mikroskopie - Histologie
<b>Neurobiologie und Verhalten</b> (12. Jahrgang, 1.Sem)	5. <b>Lernen:</b> Duftkonditionierung an Bienen (Prof. Menzel, Dr. Komischke) 6. <b>Aktionspotentiale:</b> Extrazelluläre Ableitung von Aktionspotentialen (Dr. Skiebe-Corrette) 7. <b>Neuronale Verarbeitung und Sehen:</b> Das rezeptive Feld einer Ganglienzelle (Dr. Hempel de Ibarra, Dr. Corrette)	- Verhaltensanalytik - computergestützte Messwertaufzeichnung und -auswertung - Messung von Aktionspotentialen - Computersimulation
<b>Genetik und Entwicklungsbiologie</b> (13. Jahrgang, 1.Sem)	8. <b>Signaltransduktion</b> in einem mikrobiellen Modellorganismus: „Wie Zellen miteinander reden“ (Prof. Mutzel) 9. <b>Klassische Genetik:</b> Kreuzungsexperimente mit <i>Drosophila</i> (Prof. Krüger) 10. <b>Gentechnik:</b> Bestimmung genetischer Unterschiede zwischen Menschen mittels PCR und Bioinformatik (Prof. Schönfelder)	- Mikroskopie - Photometrie - mikrobiologische Methoden - Methoden der klassischen Genetik - Polymerase-Kettenreaktion - Gelelektrophorese
<b>Evolution</b> (13. Jahrgang, 2.Sem)	11. <b>Evolution in Echtzeit:</b> Experimentelle Evolution an Mikroorganismen (Dr. Weissenmayer, Prof. Mutzel) 12. <b>Co-Evolution:</b> Evolution der Blumenformen und Bestäuber (Dipl. Biol. Ackermann, Prof. Hilger) 13. <b>Wie erstellt man Stammbäume?</b> Rekonstruktion des Amnioten-Stammbaums (Dipl. Biol. Mohr) 14. <b>Homologie und Analogie bei Insekten</b> (Dr. Steinmetz)	- mikrobiologische Methoden - Mikroskopie - Nektarmessung mit einem Refraktometer - phylogenetische Systematik
CHEMIE	Experimente	Methoden
<b>ch-2</b> <b>CH-2</b> <b>Q3 (GK)</b> <b>Q1 (LK)</b> (Klassenstufe 11-13)	<b>Elektrochemie</b> 15. <b>Brennstoffzelle</b> (PD Dr. Donner, Dr. Jochims, Dr. Stöckel, Herr Biller) 16. <b>Galvanische Verzinkung als Korrosionsschutz</b> (Herr Goerlich, Herr Igel, Atotech GmbH) 17. <b>Titration mit elektrochemischer Indikation</b> (Prof. Doblhofer, FHI)	- Energiemessung - Galvanisieren und Passivieren - Zellspannungen messen - Quantitative Analytik
<b>ch-4</b> <b>Ch-4</b> <b>Q2 (GK)</b> <b>Q3 (LK)</b> (Klassenstufe 11-13)	<b>Polymerchemie: Makromolekulare u. supramolekulare Chemie</b> (Prof. Haag, David Henschke, Dr. Richter) 18. Suspensions-/Emulsionspolymerisation 19. Dendrimer-Synthese 20. Viskositäts-Untersuchungen	<b>in Planung für SS 2006</b>
<b>ch-3</b> <b>CH-3</b> <b>Q2 (GK)</b> <b>Q3 (LK)</b> (Klassenstufe 11-13)	<b>Farbchemie: Licht-Farbe-Fotoreaktion</b> (Prof. Seppelt, Prof. Rewicki) 21. Reaktionen und Farbigeit von Übergangsmetallverbindungen 22. Synthese eines anionischen Polymethins und Isolierung des dazu konjugierten Kohlenwasserstoffs 23. VIS-Spektren anionischer Polymethine unter Variation des Chromophors	<b>wird z.T. überarbeitet</b> - Kristallisieren - Hochtemperaturreaktionen (Sintern) - Dünnschichtchromatographie Säulenchromatographie - UV/VIS-Spektren - Photoreaktion
Naturwissenschaften	Experimente	Methoden
<b>Leben im Wassertropfen</b> (5. und 6. Klasse)	24. <b>Mikroskopieren vom Pantoffeltierchen, Augentierchen und von Kieselalgen</b> (Dipl. Biol. Nitsch, Dr. Skiebe-Corrette, Dr. Corrette)	- Beobachten, mikroskopieren - zeichnen - protokollieren
<b>Bunte Baustoffe</b> (5. und 6. Klasse)	25. Messen der Temperatur beim Gipsabbinden 26. Reaktion von Marmorpulver mit Zitronensäure 27. Herstellen des Farbpigmentes „Berliner Blau“ 28. Anfertigen einer durchgefärbten Gipsfigur 29. Herstellen von Schaumgips 30. Färben eines Baumwolltuchs (alle Versuche: Dr. Richter)	- experimentieren - beobachten - messen - protokollieren - auswerten - Ergebnisse vergleichen

## NatLab: Topics offers

### 4 Biology topics (high schools)

- Plant Physiology
- Neurobiology
- Genetics
- Evolution

### 3 Chemistry topics (high schools)

- Electrochemistry
- Polymer chemistry
- Nano chemistry

### 2 Science topics (primary schools)

- Life in a drop of water
- Colorful building materials

## Special events organized by NatLab

Teacher training in cooperation with industry

Teacher training apart from visiting NatLab

**Summer university:** 10<sup>th</sup> –13<sup>th</sup> grade pupils do experiments during their vacation

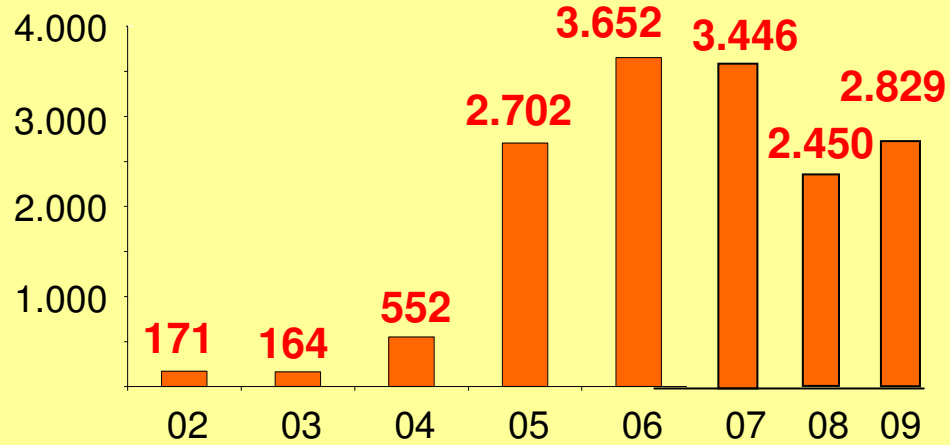
**Children's university:** 4<sup>th</sup> –6<sup>th</sup> grade pupils

Lectures for high school students

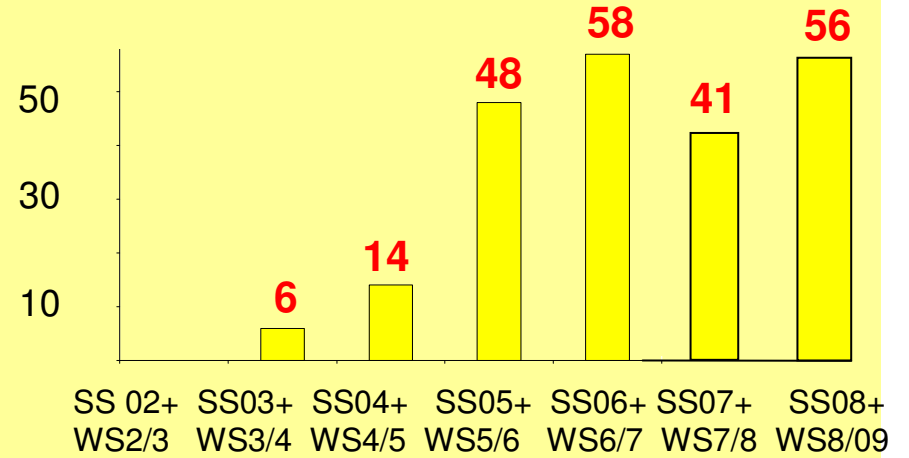


# NatLab in numbers

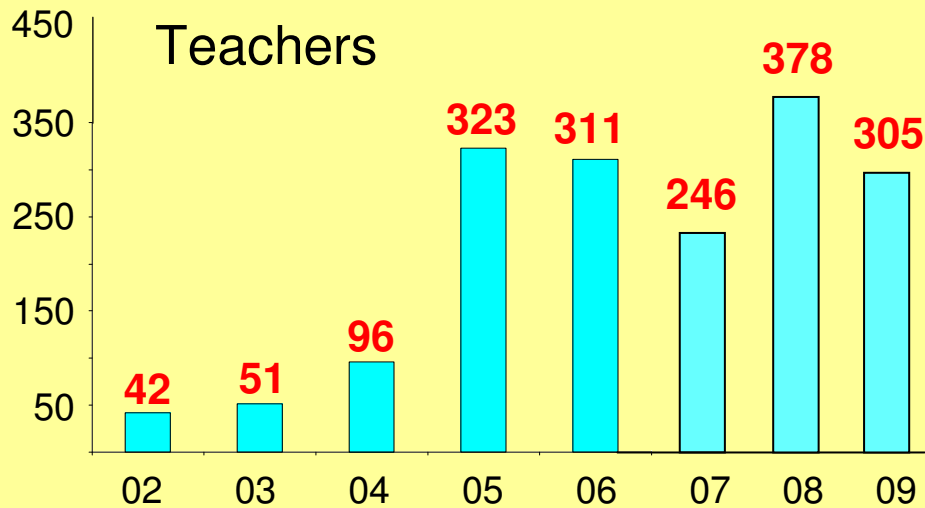
## Pupils



## University students



## Teachers



# Awards for NatLab



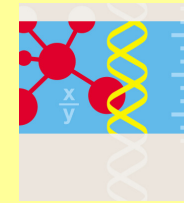
Lernort Labor Preis 2005  
Together with the Physlab of the FU



Lernort Labor Preis 2006  
Together with the Unilab and the  
Carl Zeiss Mikroskopierzentrum of the HU



NaT-Working Preis 2006  
2. Platz



Robert Bosch **Stiftung**



- 2 - 3 Informal Science Laboratories
  - PhysLab – Department of Physics
  - NatLab – Department of Biology, Chemistry, Pharmacy
  - EarthLab – Department of Geoscience, in preparation
  
- Additional activities
  - Girls' Day
  - Kinderuni: University invites primary classes
  - Sommeruni: University invites high school pupils
  - Sonnentaler / „*La main à la pâte*“
  - Activities of Didactic of Chemistry Group
  - Pollen / TuWaS! (**T**echnik **u**nd **N**atur**w**issenschaften **a**n **S**chulen)