



**XLAB**

**Göttinger Experimentallabor  
für junge Leute e.V.**

**Göttingen**

**3<sup>rd</sup> International Science Camp**

**at the Georg-August-University**

**Summer 2005**

13. August – 7. September

In collaboration with the Georg-August-University Göttingen,  
the DLR\_School\_Lab, the Max-Planck-Institute for Aeronomy,  
and the Laser Laboratory Göttingen

# Göttingen International Science Camp

XLAB organizes an International Science Camp in summer 2005 for high school students from all European countries. The Camp will take place for three weeks plus three days of excursions. Courses will be offered in biology, chemistry, physics and computer sciences. The course teachers will be scientists of the university and other research organizations in Göttingen. At the weekends and in the evenings XLAB will prepare a cultural and social program that will be guided by experienced teachers.

## Location

The new XLAB-building and all additional laboratories are located on the science campus of the University of Göttingen. The participants will stay together at the university guest house. Meals will be available at the university dining hall.



## Language

The language will be English.

## Applications

Students from all over the world, aged 17 – 22, are invited to participate. For application it is required that students provide an informal letter of recommendation by their schools, confirming their special interests in science. Parental authorization for minor students is also necessary. This should include consent on leaving the campus on their own responsibility e.g. in the evenings. German citizens and especially participants from the Göttingen area should be willing to stay at the university guest house together with all other students. Social contacts among the students with different cultural background are as important as experimental work and scientific learning.

Application form is attached. For non-obligatory enrolment and further information please send an email: [sciencecamp@xlab-goettingen.de](mailto:sciencecamp@xlab-goettingen.de).

## Number of participants

The number of participants is limited to 36. There will be 4 experimental courses per week. The number of students per course will vary between 6 and 14 depending on the capacity of the laboratories and the availability of equipment. Students work in small groups of 2 - 3. All experiments will be hands-on experiments, demonstrations are limited to highly sophisticated experiments including the use of special research instruments.

## Duration

The camp will take place from 13th August to 7th September including 3 days of excursion to Berlin at the end.

## Course teachers

Course teachers are scientists from the XLAB, the University of Göttingen, the Laser Laboratory, the DLR\_School\_Lab and the Max-Planck-Institute of Aeronomy.

## Camp Schedule

The preliminary schedule is as follows. Subsequent changes are possible. Four courses will be offered every week from which participants can choose. We will try to fulfil all requests. Please let us know your interim first choice and indicate alternatives .

### 3rd International Science Camp 2005

<b>1st week</b>	<b>2nd week</b>	<b>3rd week</b>
15th - 19th August	22nd - 26th August	29th August - 2nd September
A1 Neurophysiology	B1 Molecular Biology	C1 Developmental Biology & Embryology
A2 Analytical Chemistry	B2 Organic Chemistry	C2 Biochemistry
A3 Physics of Flying	B3 Laser Physics	C3 Astrophysics & Astronomy
A4 Informatics - Optimisation	B4 Anatomy	C4 Material Physics

**preliminary program**

## Brief description of the courses

### A 1 – Neurophysiology

*Dr. Barbara Ritter (XLAB)*

One topic of the course is molecular neurophysiology. Membrane and postsynaptic potentials and the propagation of neuronal signals are investigated. Measurements of electrical and chemical synapses of the leech and of a simple neuronal circuit will be done. In addition we will see how electrical fish can send signals and build up electrical fields using the same electrophysiological principles.



### A 2 – Analytical Chemistry

*Members of the Institute of Inorganic Chemistry (University of Göttingen)*

Modern Chemistry is similar to the work of a detective who uses his special equipment to find out as much as possible about a field of interest. In this Science Camp Course we will show you the wide variety of analytical methods using two model substances: citric acid as an example of a natural product, and an iron complex. Beneath classical methods like tests for functional groups and titrations we will use modern techniques like mass spectrometry, nmr spectroscopy and x-ray crystallography to characterize the substances and to determine the structure as complete as possible. You will also have the chance to participate in the recent research process by accompanying chemists at the chemistry department of Göttingen University.



### A 3 – Physics of Flying

*Dr. Wolfgang Send, DLR-Institute of Aeroelasticity*

The course covers the basic phenomena of flying in nature and of the foundations of aeronautical sciences. The key subjects are the force balance of weight and lift and of drag and thrust, demonstrated by a wing model, the mechanism of propulsion in animal flight, shown by an artificial bird of almost one meter span in tethered flight, and the notable flutter phenomenon of an airplane wing, in which - above a certain speed limit - power is extracted extremely fast from the surrounding air-stream, with the potential of destroying the airplane.



### A 4 – Optimisation

*Dr. Reinhard Oldenburg, XLAB*

One should never be content with less than the optimum – but how to find it? The methods of mathematical calculus can be applied in many situations, especially if they are translated to computer programs. Moreover, looking into nature suggests that optimization principles are at work in many places without any calculus. During the course we will take a broad view of problems that can be solved from an optimization point of view, and we will use and develop mathematical methods and computer programs to perform optimizations.

- The basic strategy from calculus
- Fitting curves to data points
- Geometry as optimization
- Linear programming, a technique of economy
- How soap films solve optimization problems (with experiments)
- Basic laws of physics derived from optimization principles
- Image recognition
- The travelling salesman and other discrete problems
- Nature resembled: Genetic algorithms

The participant of this course should have a basic education in univariate calculus (i.e. the theory of derivatives as is done in the 11th grade of German schools), and should have basic programming skills in any programming language.



### B 1 – Molecular Biology

*Dr. Tobias Schmidt, Dr. Eva Corinna Feil,, XLAB*

The female genealogy has created an evolutionary framework going back 150,000 years, and reveals by DNA-typing that almost everyone whose maternal roots are in Europe, is descended from one of only seven women. Each of them founded a maternal clan whose descendants make up well over 95% of modern Europeans. Your underlying mitochondrial DNA-type will be determined practical in a molecular biology laboratory.





## B 2 – Organic Chemistry

*Members of the Institute of Organic Chemistry, University of Göttingen*

Introduction to the basics of experimental organic chemistry including the synthesis of some organic compounds. Organic chemistry which covers the vast number of carbon compounds including natural products is a key player in industrial chemistry. Here, the main focus lies on the synthesis of new biological active compounds for medicine and agriculture as well as of polymers and dyes. Knowledge in preparative chemistry is therefore very useful. In the course important experimental operations as distillation, crystallisation, extraction and chromatography will be performed by you. In addition, you will synthesize an alkene by elimination of an alcohol and finally become acquainted with modern approaches in synthetic organic chemistry by carrying out a highly efficient domino reaction. This type of process saves time and resources and is beneficial to our environment.

## B 3 – Laserphysics

*Prof. Dr. Gerd Marowsky, Laser-Laboratory Göttingen e.V.,  
StR Johann Krawczyk, XLAB*

An elementary introduction into the physics of lasers and physics with lasers including technological applications. Selected applications will be chosen from LLG-activities in nonlinear optics, micromachining and environmental research such as pollution control.

Further details see [www.llg.gwdg.de](http://www.llg.gwdg.de)

## B 4 – Human Anatomy

*Dr. Joachim Rosenbusch, XLAB*

A brief theoretical introduction is followed by the preparation of porcine organ systems by the students. The course includes: heart and circulation, respiratory system, kidney and reproductive system, and in addition studies of the human brain.

## C 1 – Developmental Biology & Embryology

*Friederike Isselhorst-Schuh, Dr. Joachim Rosenbusch, XLAB  
coming soon...*

## C 2 – Biochemistry

*Dr. Barbara Ritter, XLAB*

Lactate dehydrogenase (LDH) is an important enzyme in cell metabolism of e.g. liver, heart, brain and mammals. Purification of the enzyme will be done from different pig tissues. Kinetic properties as activity and regulation of pure LDH will be studied under various conditions.

## C 3 – Physics of the Sun & Astronomy

*Dr. Frederic Hessmann, University Observatory Göttingen*

Analysis of astronomical images obtained using a world-wide network of telescopes.

*Prof. M. Schuessler, Prof. R. Schwenn, Dr. D. Schmitt, MPI Aeronomy, Dr. F. Hessmann, University Observatory Göttingen*

The Sun as an active star

Close observation of the Sun reveals a great variety of magnetic activity, from sunspots to eruptions which influence space weather and terrestrial climate. With images from satellites we follow the evolution of solar eruptions in interplanetary space. By means of a computer we analyse both observed data from the Sun as well as from numerical simulation. The students learn how physical information is extracted from scientific data. (two days, one computer per group of two students)

## C 4 – Material Physics

*Carsten Nowak, University Göttingen*

This course will introduce the participants into typical questions and methods of material physics. Using plastic deformation of a single crystal as an example one can learn how macroscopic effects and properties can be explained by processes on the atomic scale. After melting a binary alloy the registration of cooling curves will give access to phase diagrams. Additionally, the effect of heat treatment of samples on their microstructure will be investigated, this is also a first approach to material design.



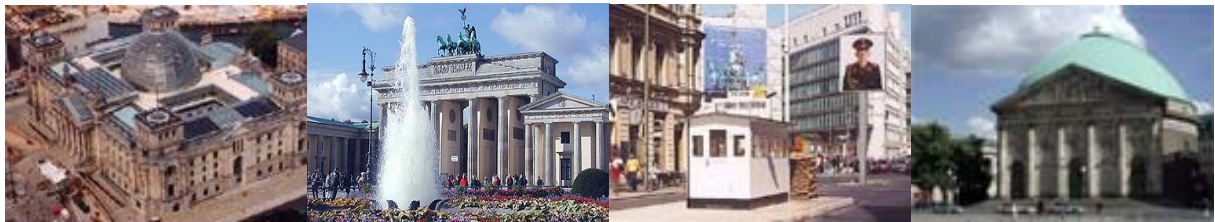
## Weekend Activities



During the weekends the students will have guided tours to the surroundings of Göttingen. For example: hiking in the Harz mountains and visits to several small medieval towns. In addition we offer the visit of seasonal cultural events in Göttingen.



## Excursion



First we will visit Berlin. Since the reunification of Germany on October 3, 1990, Berlin is again the capital of Germany. The parliament and the government moved to Berlin in 1999. Many historical buildings, places and parks have been renovated. Berlin is a pulsating city where a lot of exhibitions and happenings take place.

## Expenses

The price of the camp will be 1500€, all inclusive, except journey to and from Göttingen.

# Application for the 3<sup>rd</sup> Göttingen International Science Camp 2005

Please submit the following form by fax or post, including enclosures. Don't forget to sign!

**Fax: ++49 (0)551 / 39 12 95 1**

XLAB – Göttinger Experimentallabor für junge Leute e.V.  
Justus von Liebig Weg 8  
D 37077 Göttingen  
Germany

Deadline for application is the 15th May 2005. Registration will be confirmed in the middle of June.

Name:	
Address:	
Telephone:	E-Mail:
State/Country:	
Date of Birth:	Sex:

## Don't forget to attach:

1. a letter of recommendation and the latest marks
2. curriculum vital in tabular form incl. Photo (see the description)
3. parental authorization to participate and to leave the campus alone (for minor students only)
4. If necessary, application for financial support including a personal statement explaining the need, a maximum amount you are able to pay and documentation of family income.

## Choice of courses

The preliminary schedule is as follows. Subsequent changes are possible.

Courses in the first week	Courses in the second week	Courses in the third week
A1 - Neurophysiology	B1 - Molecular Biology	C1 - Developmental Biology & Embryology
A2 - Analytical Chemistry	B2 - Organic Chemistry	C2 - Biochemistry
A3 - Physics of Flying	B3 - Laserphysics	C3 - Astronomy & Astrophysics
A4 - Optimisation	B4 - Human Anatomy	C4 - Material Physics

Please let us know your interim first choice and indicate alternatives.

	Block A	Block B	Block C
1. Choice			
1. Alternative			
2. Alternative			

In the cell [1. Choice / Block A] you should put e.g. A1, if you want to do Neurophysiology in the first week.

Date:

Signature: