NaT-Working
Marine Research

www.ifm-geomar.de/nat-meer

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NaT-Working Programme:

Natural Sciences and Technology – a Network of Students, Teachers and Scientists

an initiative by the Robert Bosch Foundation, Stuttgart, with 70 supported projects

Basic Idea:

to stimulate students' interest in sciences via a direct contact with researchers

Examples for NaT-Working Projects:

- Autonomous Mobile Robots – Students study cybernetics (MPI Dyn. Complex Techn. Systems, Magdeburg)
- XLAB – Experimental Laboratory for Young People (Göttingen University)
- Learning by Teaching – Students teach Chemistry and Physics at Primary Schools (Halle-Wittenberg University)
Leibniz Institute of Marine Sciences

Dienstgebäude Westufer

Dienstgebäude Ostufer
A "melting pot" of sciences:

**School Disciplines:**
- Biology
- Chemistry
- Physics
- Mathematics
- Geography

**University Courses:**
- Marine Biology
- Marine Chemistry
- Physical Oceanography
- Meteorology
- Geology
- Geophysics

**Topics in Marine Science:**
- Ecosystems
- Climate Change
- Numerical Modelling
- Measurement Methods
- Biogeochemical Cycles
- Volcanism
### Participants

**Schools:**
- Freie Waldorfschule Kiel
- Gymnasium Neumünster
- Gymnasium im Hoffmann-von-Fallersleben Schulzentrum Lütjenburg
- Gymnasium Wellingdorf
- Gymnasium Bad Segeberg
- Immanuel-Kant-Schule Gymnasium Neumünster

**Institutes:**
- IFM-GEOMAR (Leibniz Institute of Marine Sciences)
- Hohe Tied e.V. (environmental protection group)
- IPN (Leibniz Institute for Science Education)
- Robert Bosch Foundation

**Workshop:**
Workshop Bad Segeberg, October 2002
Opportunities for Extracurricular Studies by Secondary Schools:

- age-group: 15-18 years
- active work instead of passive "entertainment"
- new research instead of old exercises
- personal relationships between scientists and teachers

... in the laboratory ...

... and at sea ...
Programme

central:

- student projects
- public exhibitions of results

accompanying:

- teacher work shops
- excursions on the Baltic Sea
- "rent-a-scientist"
- web activity "Ocean Online"
- evaluation

Tools:

- equipment of institute
- chartered sailing boats
- tool boxes
- website
Emphasis

- School projects accompanied by researchers
- Public exhibitions of results
- Direct involvement of teachers
Project Examples

Individual Theses: (12 months)

**Synthesis of specific oligonucleotides for the classification of cyanobacteria with nifH-sequences.**
Benjamin Schönbeck with Bernd Blume, Gymnasium Wellingdorf, Julie LaRoche a. Avan Antia, IFM-GEOMAR.

**Role of the wind field in the large-scale ocean circulation.**
Levin Stein with Stefan Theisen, Freie Waldorfschule Kiel, Joachim Dengg, IFM-GEOMAR.

**Experiments on the influence of the presence of predators on the growth of muscles.**
Grischka Nissen with Thorsten Jordan, Freie Waldorfschule Kiel, Martin Wahl, IFM-GEOMAR.

Group Projects: (3-6 months)

**Development of an algal bloom: comparing culture and nature.**
Biology LK with Götz von Arend, Gymnasium Wellingdorf, Avan Antia a. Annegret Stuhr, IFM-GEOMAR, Anja Schmitz, IPN.

**Demonstration of submarine overflow processes in a model.**
Physics LK with Eitel-Wolf Necker, Immanuel-Kant-Schule Neumünster, Andreas Macrander and Joachim Dengg, IFM-GEOMAR.
New Initiatives

- move into lower grades
- students teach students
- NaT Science Journal
- symposia with student talks
- links with other projects
Pedagogical Goals

- in compliance with the syllabus (if possible and/or required)
- oriented towards scientific topics (if possible)

... but mainly: to experience science!

- Science -"Fascination of the Unknown": how do research questions "come about"?
- interdisciplinarity: "what, chemistry too?"
- practical science: sterile laboratories and statistics, or pure adventure?
- scientific work: measurement, writing protocols, formulating hypotheses, discussion, presentation
- scientists live: Dr. Einstein and Dr. Frankenstein
- "getting a whiff": for a decision on a university course: "am I able to do that"?
Status

Students (school year 2004/05):

- 5 - 10 individual studies
- 60 - 80 students in group projects
- 100 - 150 on day cruises
- O(500) attendance in talks
- O(1000) visitors at exhibitions

Contributors:

- 5 out of 8 schools
- 10 teachers
- 5 (20) scientists

Funding:

- 2003-2006: 80,000 Euro from Robert Bosch Foundation
- 2006-....: ?

Formal Backup:

- NaT-Working
- CarboOcean
- SFB ("dedicated research project") ?
- permanent position?

Awards:

- 1st Prize by R. Bosch Foundation
behind the scenes ... :
Gain

for research institutes:

- publicity
- student recruitment
- creating awareness
- training multipliers
- training the next generation of decision makers
- fulfilling the obligation to the public

for researchers:

- contact to students
- "audience"
- "cheap labour"
- development of teaching materials
- "cheap labour"

for schools:

- access to better equipment
- increased motivation
- state-of-the-art know-how
- publicity

for students:

- fun & excitement
- orientation for university careers
- appreciation / being taken serious
### Problems

<table>
<thead>
<tr>
<th>Motivation:</th>
<th>Time Tables:</th>
<th>Subject Bias:</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;No free lunch&quot;:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• additional work for</td>
<td>• school year - academic year</td>
<td>• biology</td>
</tr>
<tr>
<td>everybody involved</td>
<td></td>
<td>• ...</td>
</tr>
<tr>
<td>• voluntary help or</td>
<td>• school day – work day</td>
<td>• ...</td>
</tr>
<tr>
<td>dedicated positions?</td>
<td>• voluntary or part of syllabus</td>
<td>• chemistry, physics</td>
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<tr>
<td>• funding</td>
<td>• science: publish or perish</td>
<td></td>
</tr>
<tr>
<td>scientists: &quot;ugh,</td>
<td></td>
<td></td>
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<tr>
<td>students!?&quot;</td>
<td></td>
<td></td>
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<tr>
<td>teachers: &quot;so many</td>
<td></td>
<td></td>
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<tr>
<td>complex topics!&quot;</td>
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<td></td>
</tr>
<tr>
<td>students: &quot;what about</td>
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<tr>
<td>grades?&quot;</td>
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### School Agendas:

- examinations
- disciplines
- "our" school vs. "their" school
- school authorities

### Age Groups:

- 15-18 only?

### Acceptance:

- official status
- visibility (media)
<table>
<thead>
<tr>
<th>Supply and Demand:</th>
<th>Internationalization:</th>
<th>Teaching Units:</th>
</tr>
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<tbody>
<tr>
<td>many schools interested</td>
<td>language barrier</td>
<td>unpopular?</td>
</tr>
<tr>
<td>limited scientific staff</td>
<td>time barrier</td>
<td>too broad</td>
</tr>
<tr>
<td>(in Germany:) competition</td>
<td></td>
<td>too specific</td>
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</tbody>
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Contacts

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