MSc programs in Switzerland

Patricia Palagi
Patricia.Palagi@isb-sib.ch
SIB Today

- 46 groups
- 650 collaborators
Four strategic goals

**SIB Vision**
The SIB helps shape the future of life sciences through excellence in bioinformatics

**SIB Mission 1**
To provide world-class core bioinformatics resources to the national and international life science research community

**SIB Mission 2**
To lead and coordinate the field of bioinformatics in Switzerland

**Strategic Goal 1**
To provide core databases, software and services worldwide

**Strategic Goal 2**
To provide key competencies & research support to the national life science research community

**Strategic Goal 3**
To federate bioinformatics research groups from Swiss universities and research institutes

**Strategic Goal 4**
To train first-rate researchers

The SIB helps shape the future of life sciences through excellence in bioinformatics.
SIB Education, Training and Outreach Activities

- High School
- Bachelor
- Master
- PhD
- Continuing education

Public in general: young, old, layperson, politicians
Bachelor and Master degrees

• SIB coordinates undergraduate education in bioinformatics together with Swiss Universities

Bachelor degree
• Basel

Master degree
• Geneva and Lausanne
• Zurich
• Basel
• Bern and Fribourg
Basel

BSc in Computational Sciences with a major in Computational Biology

- 1st year: math, physics, chemistry, and informatics

- 2nd and 3rd years (major): computational biology, bioinformatics, biophysics, systems biology, molecular and structural biology
Geneva and Lausanne – long history

- 1999 – 2004:
  - MSc in Bioinformatics Ge-Lau
- 2004 – 2011:
  - MSc in Proteomics & Bioinformatics Ge
- 2011 – today:
  - Joint specialisation in Bioinformatics inside the MSc in Biology Ge-Lau
- Future:
  - specialisation in Bioinformatics inside the MSc in Biology in Ge
  - specialisation in Bioinformatics inside the MSc in Biology in Lau
<table>
<thead>
<tr>
<th>Module</th>
<th>Title of the module</th>
<th>Responsible(s)</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to bioinformatics</td>
<td>A. Bairoch</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Standardizing courses:</td>
<td>M. Ballivet et F. Barja</td>
<td>7</td>
</tr>
<tr>
<td>2a</td>
<td>For students with a computer sciences background:</td>
<td></td>
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<tr>
<td></td>
<td>Biochemistry I</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Elements of biology</td>
<td></td>
<td></td>
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<tr>
<td>2b</td>
<td>For students with a life-sciences background:</td>
<td>B. Chopard et C. Pellegrini</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Algorithms and programming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Databases for life sciences</td>
<td>R. Appel et A. Bairoch</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Statistics and probability</td>
<td>D. Goldstein</td>
<td>6</td>
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</table>
MSc in Bioinformatics Ge-Lau

Second semester:

The second semester takes place in Lausanne with the exception of module 7 that takes place in Geneva. It consists of 4 modules and it counts for 26 credits.

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<tr>
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<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>5</td>
<td><strong>Algorithmic methods for molecular sequence analysis</strong></td>
<td>P. Bucher et C. Notredame</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td><strong>Analysis of protein structures</strong></td>
<td>T. Schwede</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td><strong>Phylogenetics analysis</strong></td>
<td>G. Bittar</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td><strong>Genomics, transcriptomics and proteomics analysis</strong></td>
<td>V. Jongeneel</td>
<td>7</td>
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</tbody>
</table>

Practical training:

Each student must do a practical training in one of the SIB’s groups or in a recognised laboratory or company of bioinformatics (in Switzerland or abroad). It can be done during summer (after the last exam section) or during the third or fourth semester.

<table>
<thead>
<tr>
<th>Module</th>
<th>Title of the module</th>
<th>Responsible(s)</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Practical training</td>
<td>P. Palagi</td>
<td>8</td>
</tr>
</tbody>
</table>
MSc in Bioinformatics Ge-Lau

1 or 1.5 year

1st sem.

2nd sem.

summer

Mandatory courses

Mandatory courses

Masters thesis
MSc in Proteo. & Bioinf. Ge

- Elements of Bioinformatics
- Programming for bioinformatics
- Statistics and probability

1.5 year

<table>
<thead>
<tr>
<th>1st sem.</th>
<th>2nd sem.</th>
<th>3rd sem.</th>
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</thead>
<tbody>
<tr>
<td>Mandatory courses</td>
<td>Optional courses</td>
<td>Masters thesis</td>
</tr>
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<td></td>
<td>&amp; Masters thesis</td>
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MSc Biology Major Bioinf. Ge-Lau

- Elements of Bioinformatics
- Programming for bioinformatics
- Statistics and probability

1.5 year

- Masters thesis (3rd sem.)
- Optional courses & Masters thesis (2nd sem.)
- Mandatory courses (1st sem.)
MSc Biology Major Bioinf. Ge-Lau

- Elements of Bioinformatics
- Programming for bioinformatics
- Statistics and probability

- Sequence a genome
- 1st steps in programming

1.5 year

1st sem.
Mandatory courses

2nd sem.
Optional courses & Masters thesis

3rd sem.
Masters thesis
MSc Biology Major Bioinf. Basel

1.5 year

- **1st sem.**
  - Optional courses

- **2nd sem.**
  - Masters thesis

- **3rd sem.**
  - Masters thesis
Zurich

- Master's in Computational Biology and Bioinformatics
- Jointly organised by: ETHZ and Univ. Zurich

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Points</th>
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<tbody>
<tr>
<td>Master Thesis</td>
<td>30</td>
</tr>
<tr>
<td>Lab Rotations</td>
<td>9</td>
</tr>
<tr>
<td>General Courses</td>
<td>21</td>
</tr>
<tr>
<td>Core Bioinformatics</td>
<td>30</td>
</tr>
<tr>
<td>Preparation (depending on Bachelors degree)</td>
<td></td>
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<tr>
<td>Bachelor in: Biology, Chemistry, Mathematics, Physics, Computer Science or Engineering</td>
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</tbody>
</table>
Zurich

Core Bioinformatics grouped in 3 focus areas:

- **Structures**: molecular modeling, structural bioinformatics
- **Sequences**: sequence analysis, alignment, phylogenetic trees
- **Systems**: modeling and analysis of biological networks

At least one course from each of the three focus areas has to be attended
Bern and Fribourg

- Master’s in Bioinformatics and Computational Biology
- Jointly organised by: Universities of Bern and Fribourg
Conclusions (just some)

• MSc cross institutions: need to have a common understanding since the start
• MSc in bioinformatics is difficult to be research driven: pre-required knowledge
• Define these pre-requirements early: otherwise too much time spent in filling the gaps