From Theory to Practice:

Milestones for Successfully Filing Patent Applications
Today’s Outline

• **Goal**: Enabling you to find out whether you have (probably) made an invention and to write down a patent application draft / fill in an IDF (Invention Disclosure Form)!

• Warm-up: Short “Arosa” review
• The milestones step by step, including:
  – Important substantial patent law
  – Examples
  – Check list for IDF / patent application drafting
  – Optional: Case study
• Individual tutoring
  – Technical contents discussed in this workshop may concern inventions, and so all technical contents have to be treated confidentially by all of us!
Warm-Up: Short Arosa Review

- Patents as part of IP
- Ways for filing patent applications (national, European, international)
- Territory principle
- Rights conferred by a patent
- Importance of patent protection:
  
  Patent protection is decisive for your freedom to operate in industry!
Is your idea an invention?

• Statistical answer
  – Probably YES, because statistically for each 2\textsuperscript{nd} patent application there is granted a patent and you all do research at the high front end of science!

• Individual answer
  – Check requirements of substantial patent law
Milestone 1: Substantial Patent Law

Art. 52 (1) EPC (European Patent Convention):

„European patents shall be granted for any inventions, in all fields of technology, provided that they are
- new
- involve an inventive step, and
- are susceptible of industrial application.“
Novelty I

• Legal definition Art. 54 EPC:

(1) An invention shall be considered to be new if it does not form part of the state of the art.

(2) The state of the art shall be held to comprise everything made available to the public by means of a written or oral description, by use, or in any other way, before the date of filing of the European patent application.
Novelty II

- Decisive date: Filing date of patent application
- Different kinds of prior art:
  - Written, oral, use, etc
  - Examples: Papers, talks, patent documents, books, prototypes...
- Availability to the public
  - No restriction with respect to language or territory
- Separate comparison of your invention with each prior art
Novelty: Example 1

- **Idea for invention**: 1.01.
- **Group seminar**: 1.02.
- **Submission of science paper**: 1.05.
- **Publication of science paper**: 1.12.
- **Publication on preprint server** → novelty destroyed: 15.05.

**Filing date of patent application**: 20.05.

**Novelty of invention?**
- **YES, but dangerous!**
Novelty: Example 1a

Novelty of invention?
YES, secure!
Novelty: Example 2

**Invention:**
Mobile phone with integrated camera

**Prior art 1:**
Mobile phone *without* integrated camera

**Prior art 2:**
A camera

Novelty of invention? **YES**
**Novelty: Example 3**

<table>
<thead>
<tr>
<th><strong>Invention:</strong></th>
<th><strong>Prior art 1:</strong></th>
<th><strong>Prior art 2:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile phone with integrated camera</td>
<td>Mobile phone with integrated camera</td>
<td>Mobile phone with integrated camera and with integrated computer</td>
</tr>
</tbody>
</table>

Novelty of invention? **NO!**
Novelty: Example 4 – Set Theory

Invention: \(a, b, c\)

Prior art: \(d, e\)

Novelty:
- \(a, b, c\) vs. \(d, e\): yes
- \(a, b, c\) vs. \(d, e\): yes
- \(a, b, c\) vs. \(d, e\): no
Inventive Step I

• Legal definition Art. 56 EPC (excerpt):

An invention shall be considered as involving an inventive step if, having regard to the state of the art, it is not obvious to a person skilled in the art.
Inventive Step II

- Viewpoint of fictitious “person skilled in the art”
  - Practitioner, technical engineer, single person or group
  - Access to entire state of the art
  - No inventive skills *per definitionem*

- *Combination* of disclosures of prior art
  - Test feature combinations
  
  Q1: Each essential feature of invention somewhere disclosed?
  - No: invention; end 😊
  - Yes: not sure; continue with Q2!
  
  Q2: Motivation for invention’s feature combination disclosed?
  - Yes: no invention
  - No: invention (combination invention) 😊
**Inventive Step: Example 1**

**Invention:**
Mobile phone with integrated camera

**Prior art 1:**
Mobile phone *without* integrated camera

**Prior art 2:**
A camera.

Statements in document:
„Cameras getting smaller and smaller“
„Digitalization of cameras enables their integration in other handheld devices.“

**Novelty of invention?**  YES

**Inventive Step?**  NO!
Indicators for Inventive Step

• Specific advantages over the prior art
  – Smaller, faster, easier to construct, additional effects...
• Technical prejudice is overcome
• Surprising effects
• Fulfillment of ancient technical need
• …
• No contribution approach: Alternative solution to already solved technical problem can be sufficient (not necessarily better than known solution)
• Always some room for discussion!
Milestone 2: Search for Prior Art

– Check scientific papers of rival groups
– Check patent data base
  • DEPATISnet (German Patent & Trademark Office)  
    http://depatisnet.dpma.de/DepatisNet
  • EspaceNet (EPO)  
    http://www.epo.org/searching/free/espacenet.html
  • Search criteria (examples):
    key words in title or full text, applicants, inventors, countries
    check various languages
    keep records of your search strategy
Milestone 3: IDF / Application Draft

- Structure of a patent document (Patent Attorney)
  - Titel
  - Technical field of the invention
  - State of the art
  - Description of the invention (general)
  - Description of preferred embodiments (figures)
  - Claims
Draft Preparation: To-Do List

1. Describe the state of the art. Give references / search results.

2. Describe your invention in a general and comprehensible manner. Try to stress the key features of your invention. (->Definition of invention)

3. What are the important differences between your invention and the state of the art? (-> Novelty)

4. Which advantages does your invention have compared to the prior art? (-> Inventive step)

5. Give more concrete examples of your invention (e.g. figures and detailed descriptions, un-submitted paper drafts). (-> Practicability)

6. Do you see alternative possibilities for realizing your invention? Future developments? (-> Broad scope, avoid circumvention)
Contact information:

ATHENE PATENT
Patent Attorneys
Dipl.-Phys. Dr. Carmen Tesch-Biedermann

Hanns-Schwindt-Str. 11
D-81829 Munich

Tel.: +49-(0)89-46 26 158-0
Fax: +49-(0)89-46 26 158-209

Email: info@athene-patent.de
Web: www.athene-patent.de
1. Describe the state of the art. Give references.

Basic requirements:
- implementation of qubit system
- quantum gate implementation (controlled interaction between qubits)

Known quantum computing approaches (excerpt):
- ion traps (electronic excitation; harmonic oscillation – Coulomb interaction)
- NMR (nuclear spins in molecules; strong spin-coupling interaction)
2. Describe your invention in a general and comprehensible manner. Try to stress the key features of your invention.

- New physical realization of qubit system: vibrational modes of a molecule (3N-6 normal modes)

- Interaction between normal modes: system inherent property of the molecule, via molecular bondings, Culomb force

- Quantum gates: laser spectroscopy; shaped fs laser pulses lead to controlled transitions between normal modes

- State preparation and read-out: known approaches in laser spectroscopy and laser diagnostics
Case Study (continued)

3. What are the important differences between your invention and the state of the art?

- New definition of qubit system
- Interaction for quantum gates is system-inherent, no separate interaction required
- Laser spectroscopy is a well-established laboratory tool; easier realization
Case Study (continued)

4. Which advantages does your invention have compared to the prior art?

- Laser spectroscopy is a well-established laboratory tool; easier realization
- Ensemble preparation: positive influence on signal strength; signal strength is generally higher than in NMR approaches
- Very fast quantum logic operations (fs timescale)
- Decoherence: no core problem
- Good scaling behavior
Case Study (continued)

5. Give more concrete examples of your invention (e.g. figures and detailed descriptions, unpublished paper drafts).

- Model system: acetylene $\text{C}_2\text{H}_2$ (\textit{ab initio} calculations)
- IR active normal modes as qubits
- Calculation of universal set of quantum gates with optimal control theory (shaped IR pulses, fs regime); calculation of mask function for experimental realization
- Deutsch-Josza algorithm etc.
- Paper drafts (unpublished before patent application!)
6. Do you see alternative possibilities for realizing your invention? Future developments?
- Design of specific macro molecules with repeated substructures -> easier calculation of quantum gates; good experimental access
- Not just IR-active vibrational modes, but also Raman-active modes as qubits