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From Theory to Practice:

# Milestones for Successfully Filing Patent Applications

ETH - Zurich 7.11.2012 - Dr. Carmen Tesch-Biedermann

# 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 2nd 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:

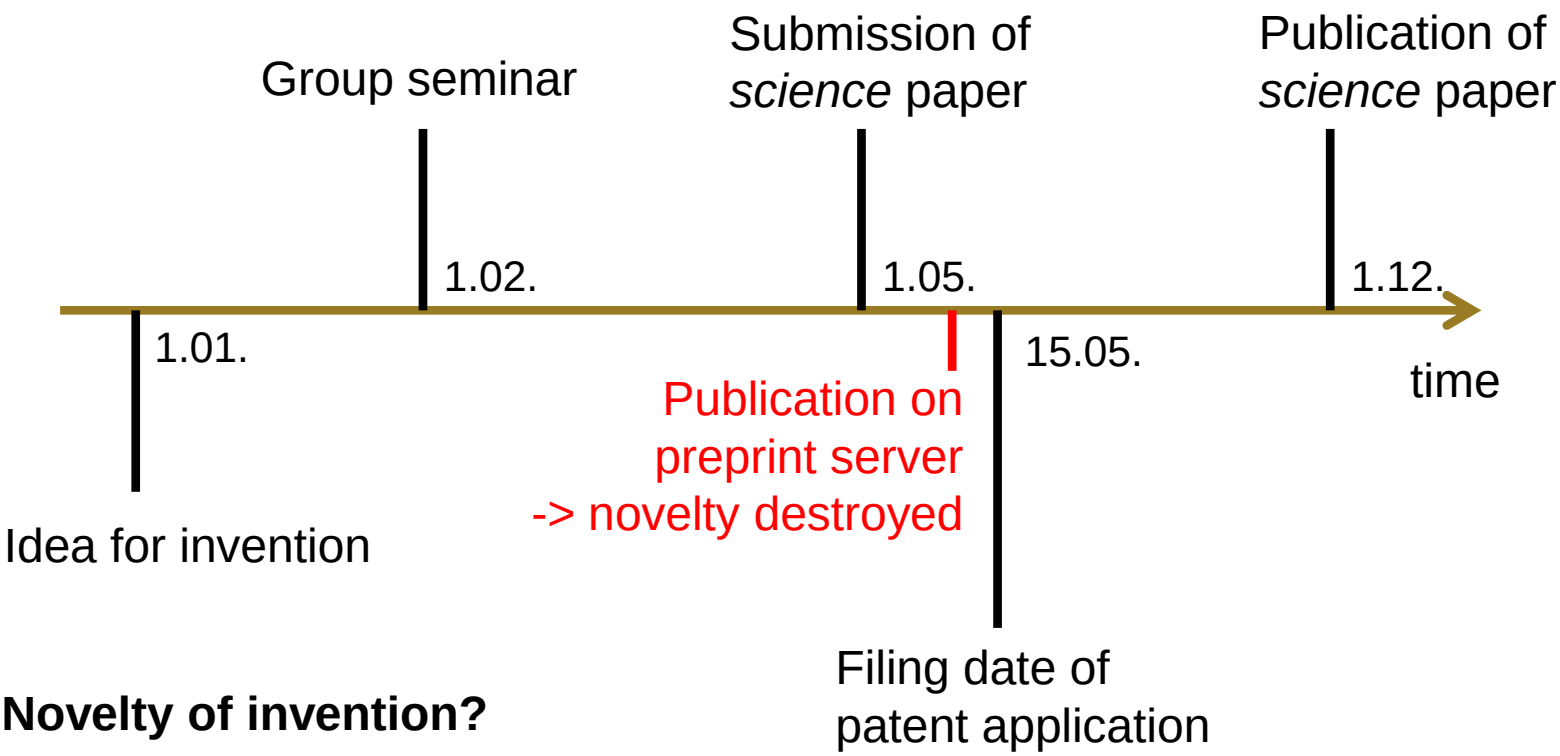
*(1) An invention shall be considered to be **new** if it does not form part of the state of the art.*

*(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

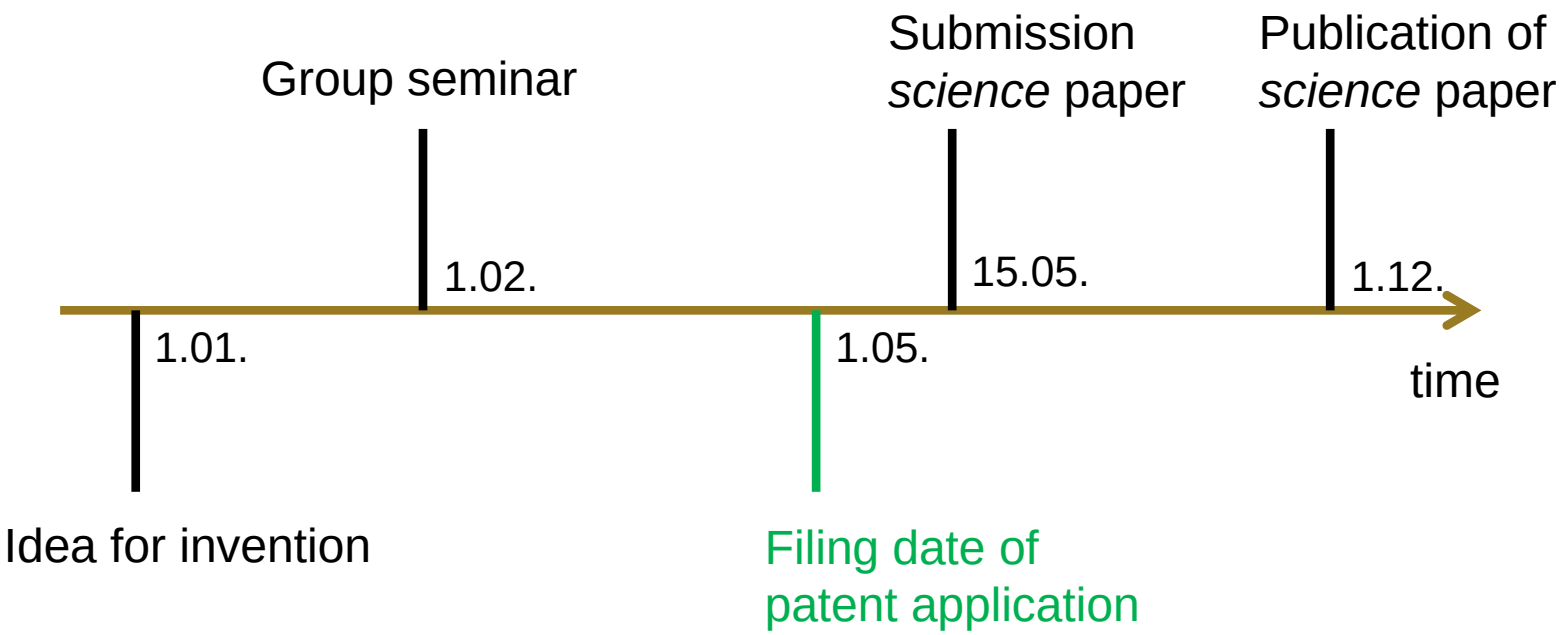
# Novelty: Example 1




**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

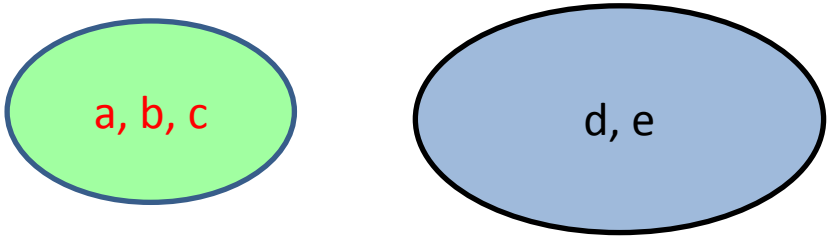
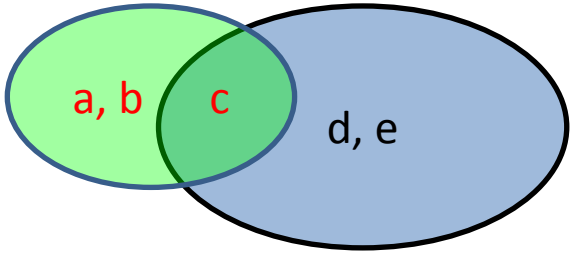
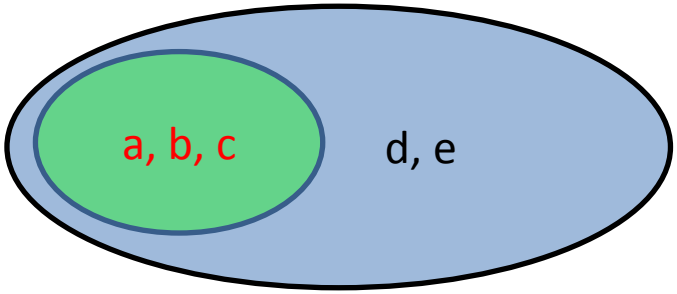
**Invention**:
Mobile phone
with integrated
camera

**Prior art 1**:
Mobile phone
with integrated
computer

**Prior art 2**:
Mobile phone
with integrated camera and
with integrated computer

**Novelty of invention?** **NO!**

# Novelty: Example 4 – Set Theory

| Invention: | Prior art: | Novelty |
|---|---|---|
|   | | yes |
|   | | yes |
|   | | 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

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# 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

Motivation of invention

Arguments for patentability; legal definitions

Deeper understanding; Experimental data; practicability

scope

# 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)

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# Case Study: Quantum Computing

**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)

# Case Study (continued)

**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, un-submitted paper drafts).**

- Model system: acetylene $C_2H_2$ (*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!)

# Case Study (continued)

**6. Do you see alternative possibilities for realizing your invention? Future developments?**

- Design of specific macro molecules with repeated sub structures -> easier calculation of quantum gates; good experimental access
- Not just IR-active vibrational modes, but also Raman-active modes as qubits