Good Scientific Practices

TECHNISCHE UNIVERSITÄT MÜNCHEN

Kickoff Event for PhD candidates in physics

Dr. Emil Ratko-Dehnert (Garching - 22.02.2017)

ProLehre

- ProLehre is the Department for Teaching and Learn @TUM, supporting teaching staff via
  - counselling and faculty-specific services (e.g. Teach
  - course program to acquire "Certificate for Teachin Higher Education of the Bavarian Universities"
- Faculty contact persons

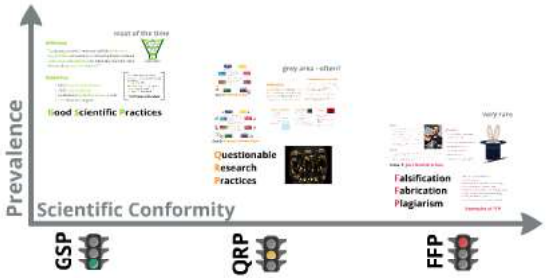
Dr. Emil
Ratko-Dehnert

- Visit us
  - at http://www.prolehre.tum.de/
  - or every Thursday, 10 a.m - 1 p.m at our office in M

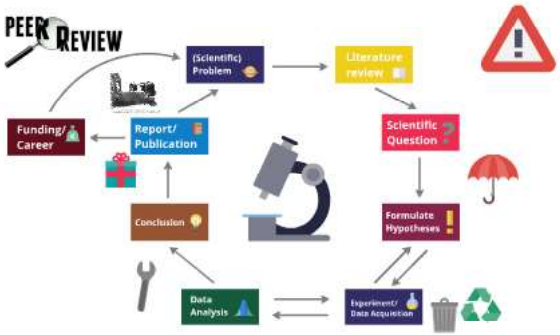
Thank you for your attention!

Good luck with your Ph.

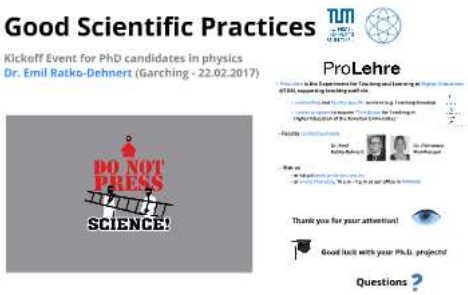
Questions

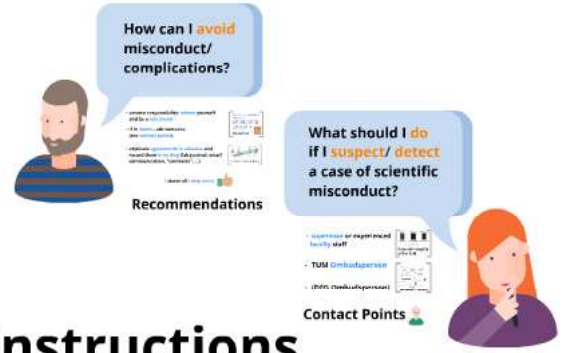


Continuum of Scientific Conduct



Cycle of Science





Instructions

- propagate core values of the scientific enterprise
- prevent scientific misconduct (with all of its consequences)
- reflect on your new role(s) in the scientific community

Motivation

- familiarization with GSP, TUM Code of Conduct
- sensitizing to different forms of scientific misconduct
- information about contact persons, ombuds process and further reading

- no introduction on philosophy of science
- no journal-specific requirements for publishing
- completeness not warranted

Goals

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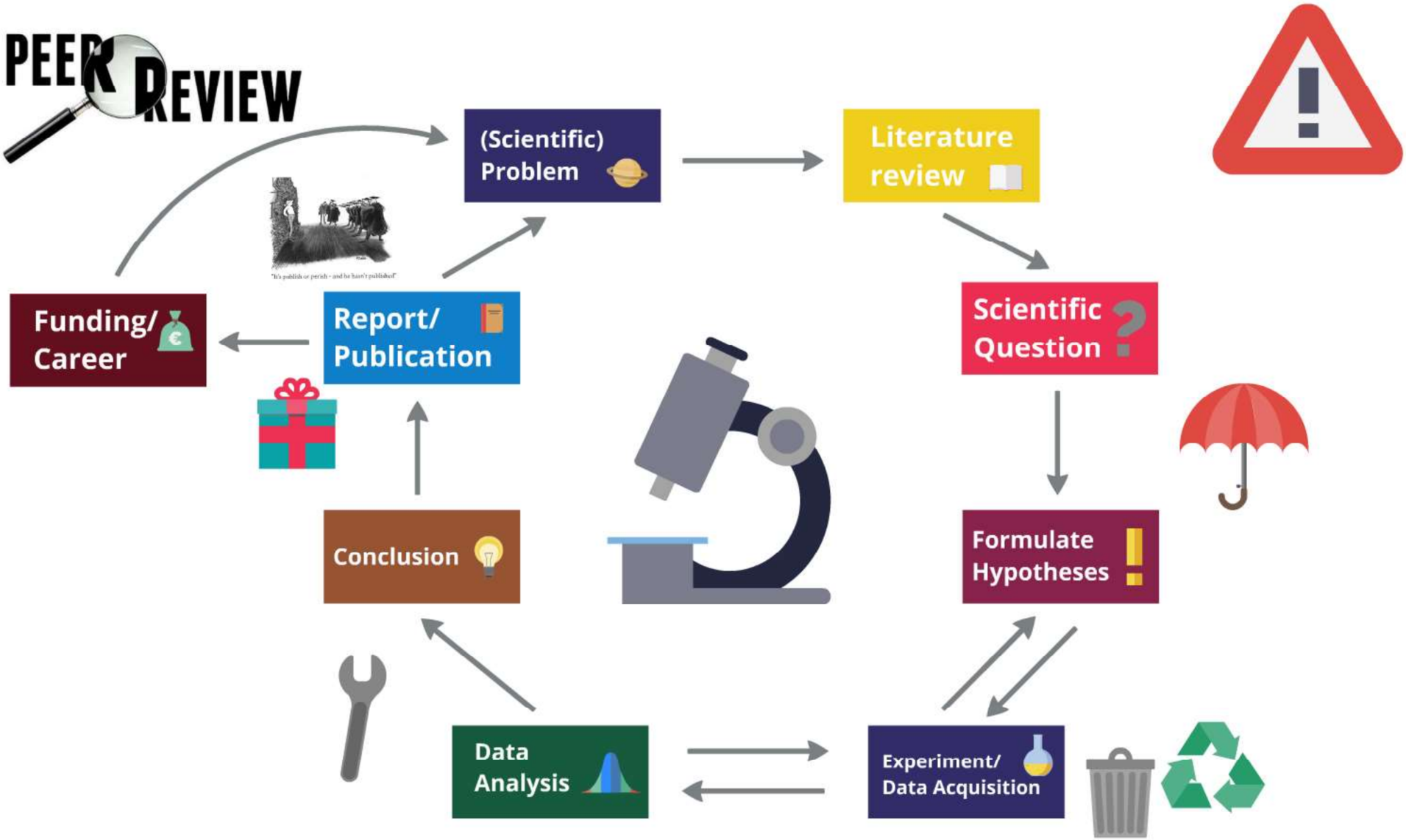
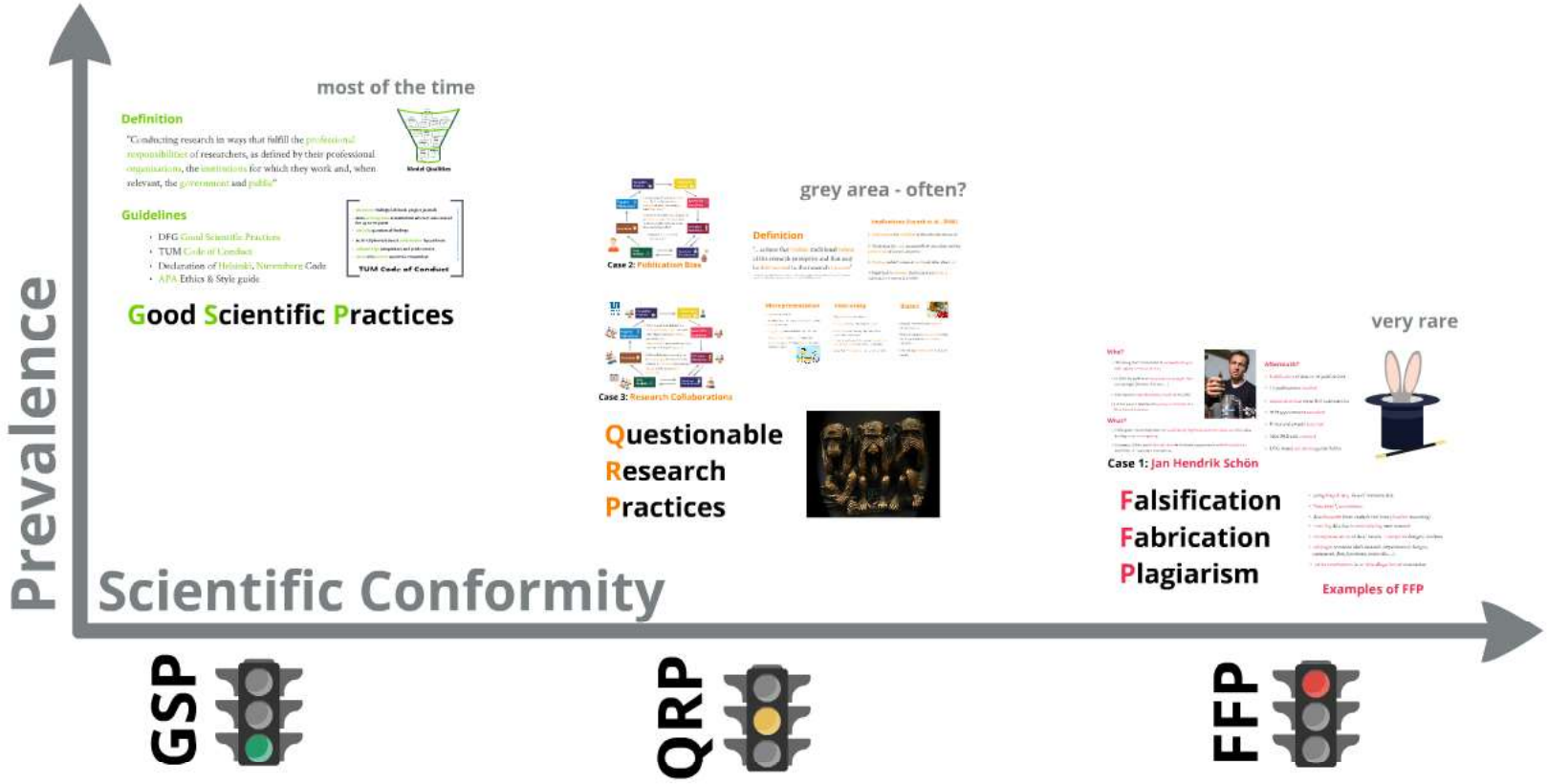


Cycle of Science

"It's publish or perish - and he hasn't published"

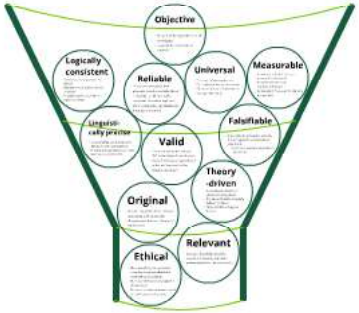


Continuum of Scientific Conduct

most of the time

Definition

"Conducting research in ways that fulfill the professional responsibilities of researchers, as defined by their professional organisations, the institutions for which they work and, when relevant, the government and public"



Model Qualities

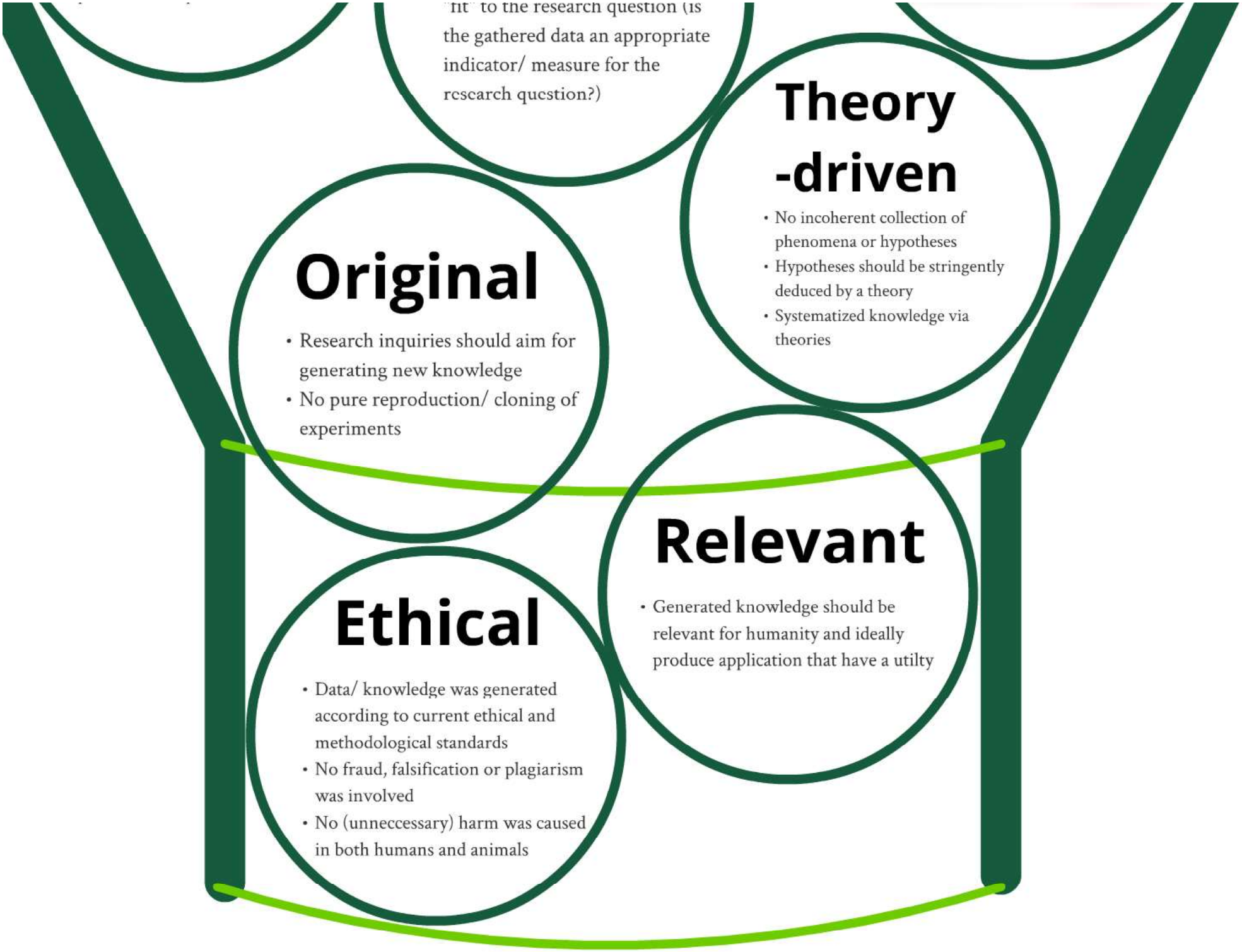
Guidelines

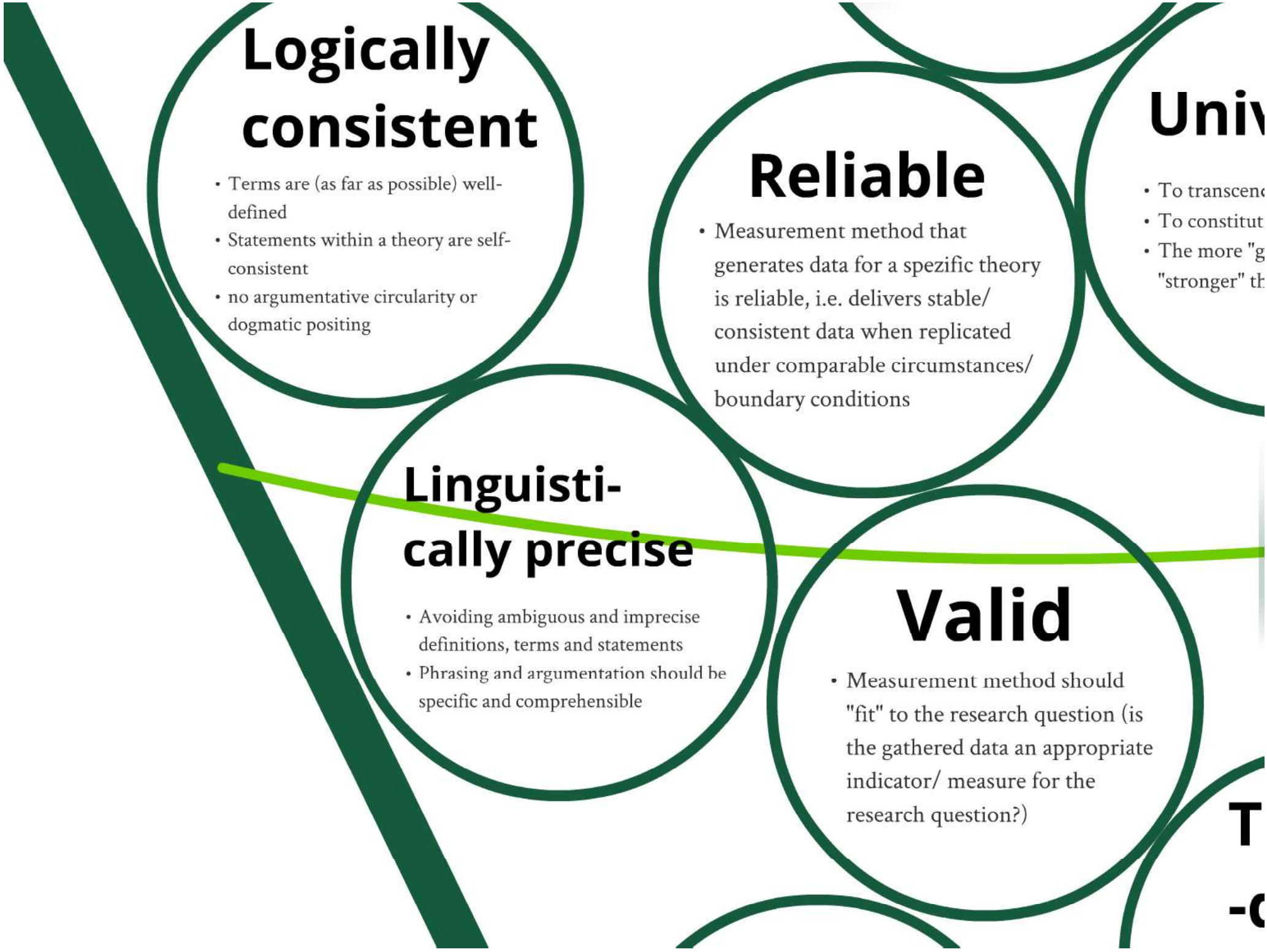
- DFG Good Scientific Practices
- TUM Code of Conduct
- Declaration of Helsinki, Nuremberg Code
- APA Ethics & Style guide

- document findings (lab book, project journal)
- store primary data at institution where it was created (for up to 10 years)
- critically question all findings
- be strictly honest about contributions by partners
- acknowledge competitors and predecessors
- avoid and prevent academic misconduct

TUM Code of Conduct

Good Scientific Practices


fit" to the research question (is the gathered data an appropriate indicator/ measure for the research question?)
Theory -driven
• No incoherent collection of phenomena or hypotheses
• Hypotheses should be stringently deduced by a theory
• Systematized knowledge via theories
Original
• Research inquiries should aim for generating new knowledge
• No pure reproduction/ cloning of experiments
Relevant
• Generated knowledge should be relevant for humanity and ideally produce application that have a utilty
Ethical
• Data/ knowledge was generated according to current ethical and methodological standards
• No fraud, falsification or plagiarism was involved
• No (unneccessary) harm was caused in both humans and animals


Logically consistent
• Terms are (as far as possible) well-defined
• Statements within a theory are self-consistent
• no argumentative circularity or dogmatic positing
Reliable
• Measurement method that generates data for a spezific theory is reliable, i.e. delivers stable/ consistent data when replicated under comparable circumstances/ boundary conditions
Univ
• To transcend
• To constitut
• The more "g
"stronger" th
Linguisti-cally precise
• Avoiding ambiguous and imprecise definitions, terms and statements
• Phrasing and argumentation should be specific and comprehensible
Valid
• Measurement method should "fit" to the research question (is the gathered data an appropriate indicator/ measure for the research question?)
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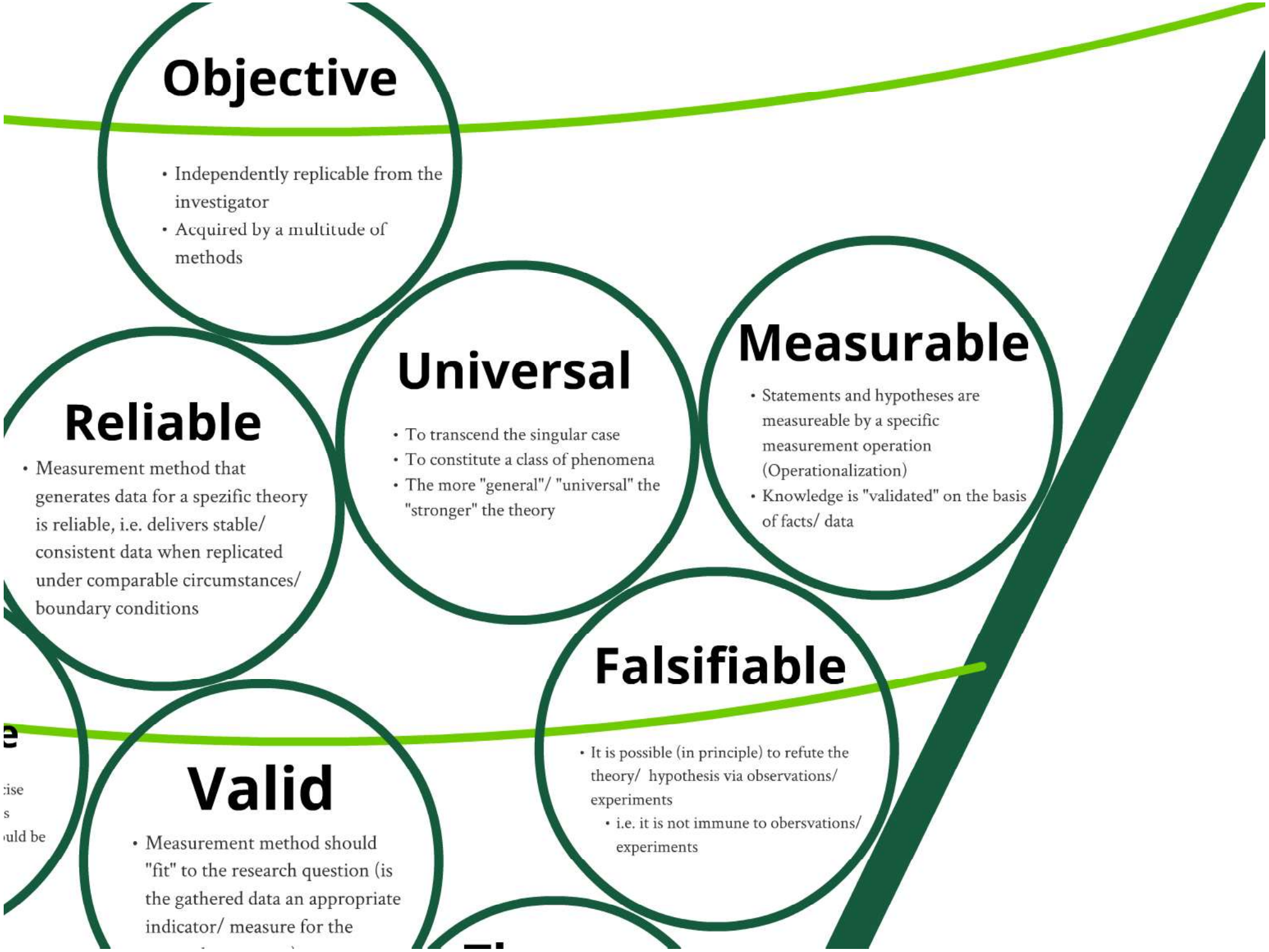
Objective
• Independently replicable from the investigator
• Acquired by a multitude of methods
Reliable
• Measurement method that generates data for a spezific theory is reliable, i.e. delivers stable/ consistent data when replicated under comparable circumstances/ boundary conditions
Universal
• To transcend the singular case
• To constitute a class of phenomena
• The more "general"/ "universal" the "stronger" the theory
Measurable
• Statements and hypotheses are measureable by a specific measurement operation (Operationalization)
• Knowledge is "validated" on the basis of facts/ data
Falsifiable
• It is possible (in principle) to refute the theory/ hypothesis via observations/ experiments
• i.e. it is not immune to obersvations/ experiments
Valid
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TUM Code of Conduct

http://www.gs.tum.de/en/doctoral-candidates/good-scientific-practice/faq/

Who?

- "Shooting Star" in the field of nanotechnologies and organic semiconductors
- In 2001 he published one paper every eight days (on average) (Nature, Science, ...)
- Announced groundbreaking results in his field
- On his way to become the youngest director of a Max Planck Institute

What?

- Colleagues voiced skepticism of suspiciously high measurement accuracy in his data, leading to an investigating
- Outcome: Schön used identical data for different experiments and fabricated data with help of computer simulations

Case 1: Jan Hendrik Schön

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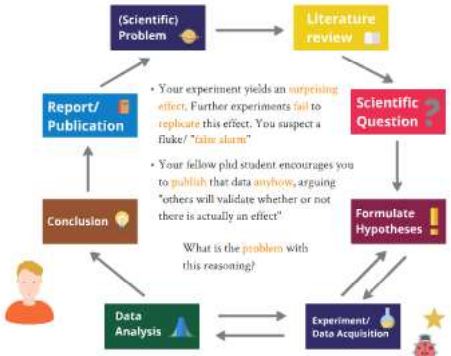
ndrik Schön

Aftermath?

- Falsification of data in 16 publications
- 13 publications recalled
- instant dismissal from Bell Laboratories
- MPI appointment cancelled
- Prizes and awards returned
- 2004 PhD title revoked
- DFG issued sanctions against Schön

- using forged data, data of someone else
- "idea-theft", uncitedness
- data discarded from analysis (without plausible reasoning)
- omitting data that is contradicting own research
- misrepresentation of data/ results • deceptive designs/ analyses
- sabotagin someone else's research (experimental designs, equipment, data, hardware, materials, ...)
- active involvement in or false allegations of misconduct

Examples of FFP



Case 2: Publication Bias

grey area - often?

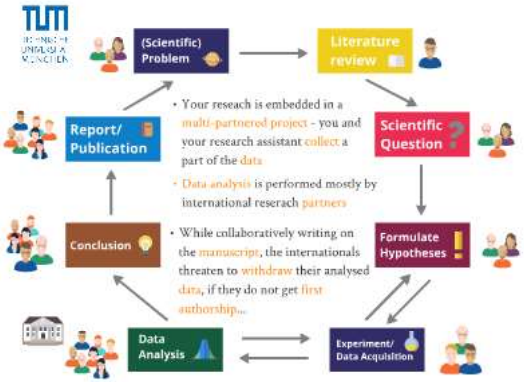
Definition

"…actions that violate traditional values of the research enterprise and that may be detrimental to the research process"

Committee on Science, Engineering, and Public Policy (U.S.). Panel on Scientific Responsibility and the Conduct of Research (1992). Responsible science: Ensuring the integrity of the research process. National Academy Press. Washington, D.C.

Implications (Stenek et al., 2006)

1. Undermining the credibility of the scientific enterprise
2. Weakening the trust amongst fellow researchers and the public credit of science altogether
3. Wasting (public!) research funds (and time, effort, ...)
4. Might lead to decisions that bring about harm to individuals or society as a whole



Case 3: Research Collaborations

Misrepresentation

- Order of authorships
- unpublished publications cited as "in press", citing arXiv manuscripts
- exaggerating own contribution to publication
- "Salami Slicing" und duplicate publications
- honorary/ guest authorships, ghost authorships (substantial roles!)

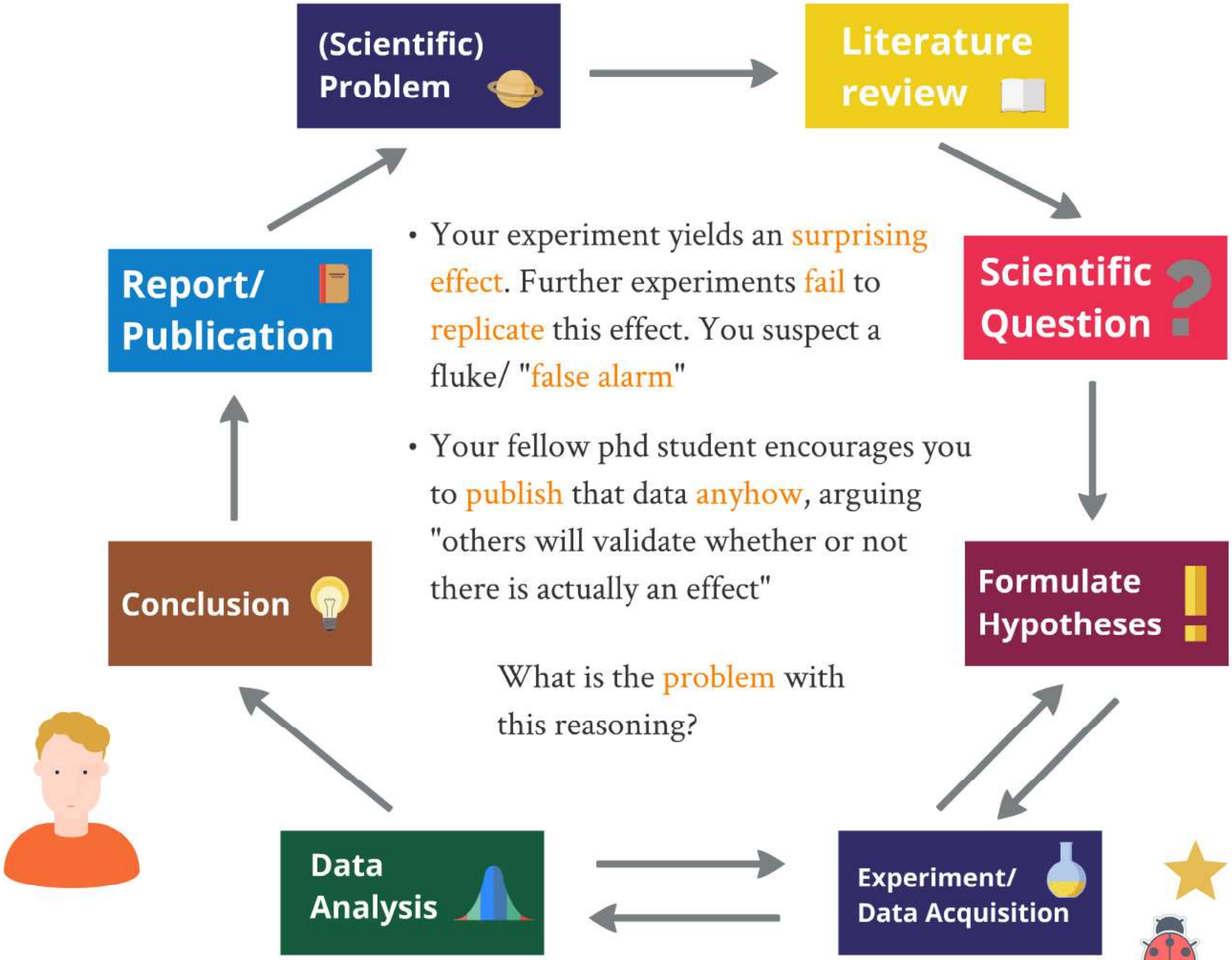
Inaccuracy

- "honest" mistakes and errors
- citation errors (e.g. forgetting someone)
- referencing errors (wrong implications from abstracts and conclusions)
- experimental design or data analyses described too vaguely/ ambiguously (and thus not replicable)
- use of "false"/ inappropriate analyses and statistics

Biases

- financial interests (study sponsor, institution, ...)
- Bias with respect to country of origin, institute, scientific community, authors, ...
- self-serving interpretation of data and results

Questionable Research Practices



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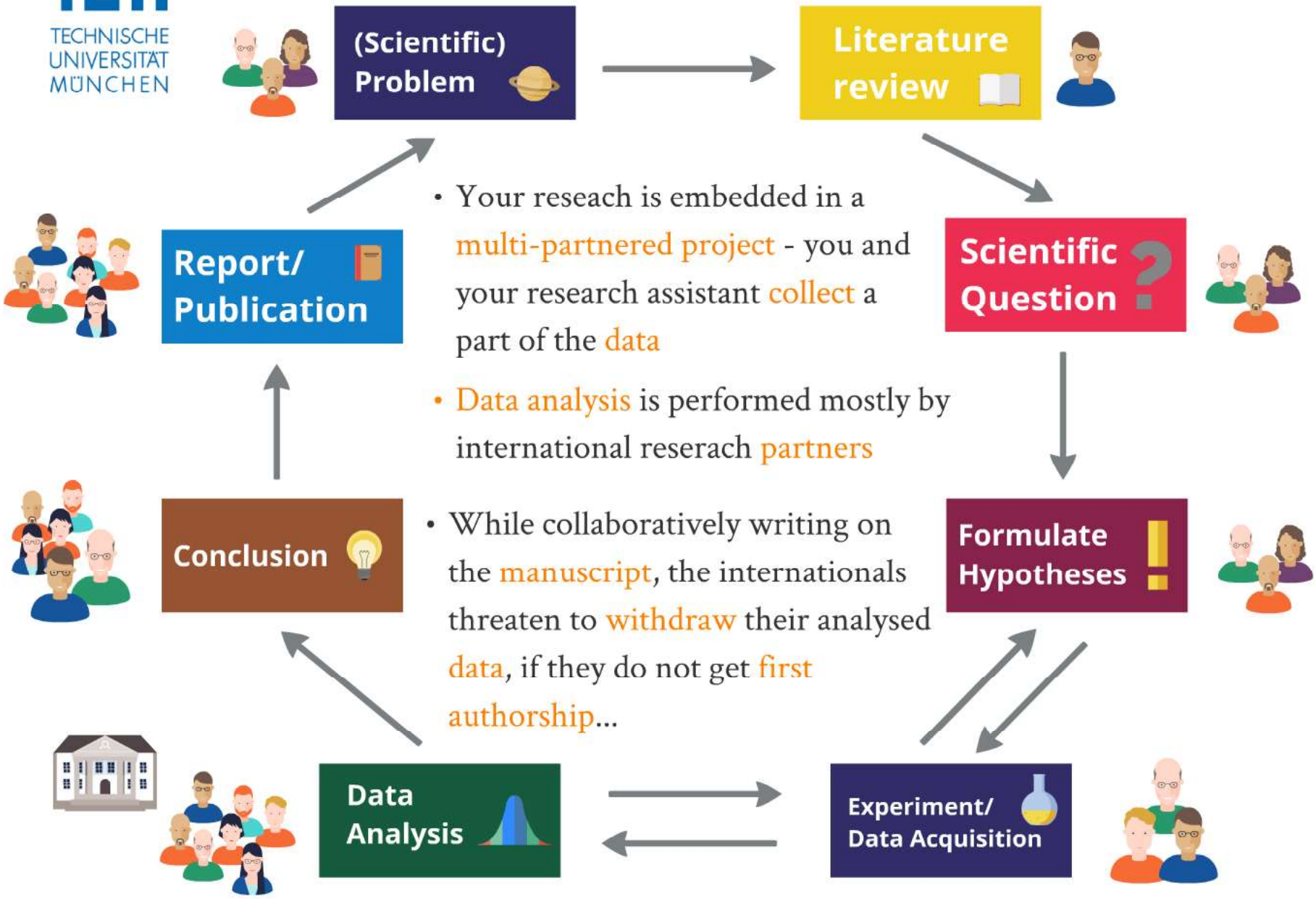
TECHNISCHE UNIVERSITÄT MÜNCHEN



- Your reseach is embedded in a multi-partnered project - you and your research assistant collect a part of the data
- Data analysis is performed mostly by international reserach partners
- While collaboratively writing on the manuscript, the internationals threaten to withdraw their analysed data, if they do not get first authorship...

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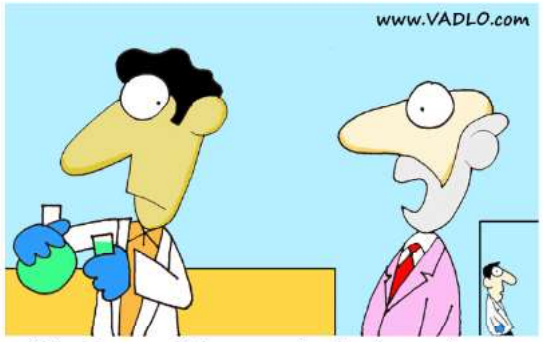

"No, it's my wife's turn to be the first author on **your** paper."

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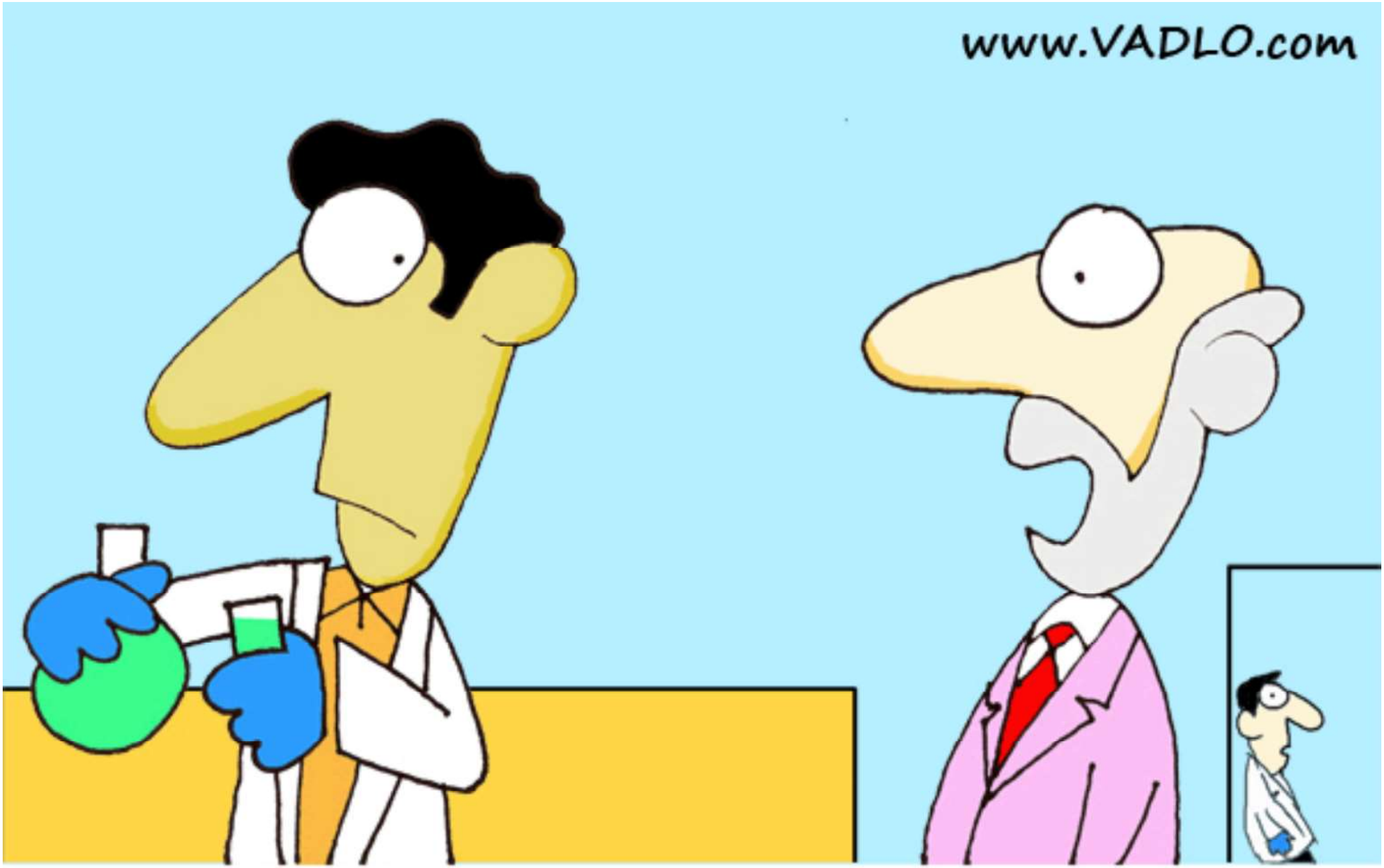

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Technische Universität München

ZERTIFIKAT

Die Carl von Linde-Akademie
Zentralinstitut der Technischen Universität München
bestätigt hiermit:

Herr
Dr. John Doe
Lehrstuhl für Experimentelle Astroteilchenphysik (TU München)

- **Faculty contact persons**

Dr. Emil Ratko-Dehnert

Dr. Christiane Marxhausen

- **Visit us**
  - **at http://www.prolehre.tum.de/**
  - **or every Thursday, 10 a.m - 1 p.m at our office in MW0005**

Instructions

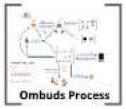
How can I avoid misconduct/ complications?

- assume responsibility: inform yourself and be a role model
- if in doubt - ask someone (see contact points)
- explicate agreements in advance and record them in writing (lab journal, email communication, "contracts", ...)
- above all - stay clean

Recommendations

What should I do if I suspect/ detect a case of scientific misconduct?

- supervisor or experienced faculty staff
- TUM Ombudsperson
- (DFG Ombudsperson)



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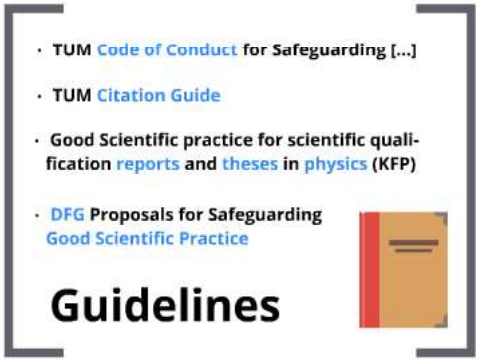

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Recommendations

- TUM Code of Conduct for Safeguarding [...]
- TUM Citation Guide
- Good Scientific practice for scientific qualification reports and theses in physics (KFP)
- DFG Proposals for Safeguarding Good Scientific Practice

Guidelines

1st author

- highest contribution on content

2nd author

- second highest contribution on content

...

(n-1)-th author

- project member - second highest resposibility

n-th author

- project leader - highest responsibility

or strictly alphabetically(!)

"implicit rules" for order of authorships

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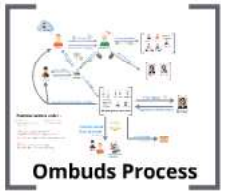

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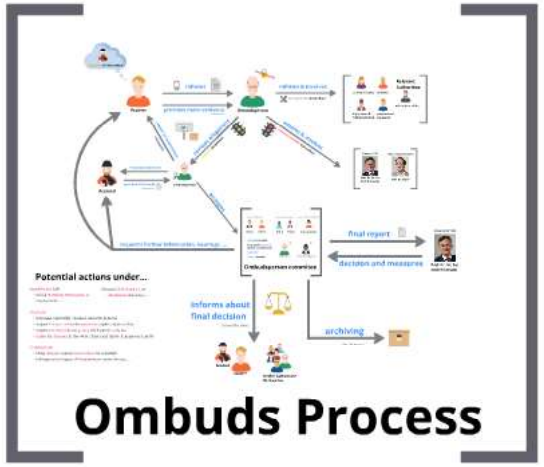


Contact Points

Project Leader

Erika Schropp

Ombuds person

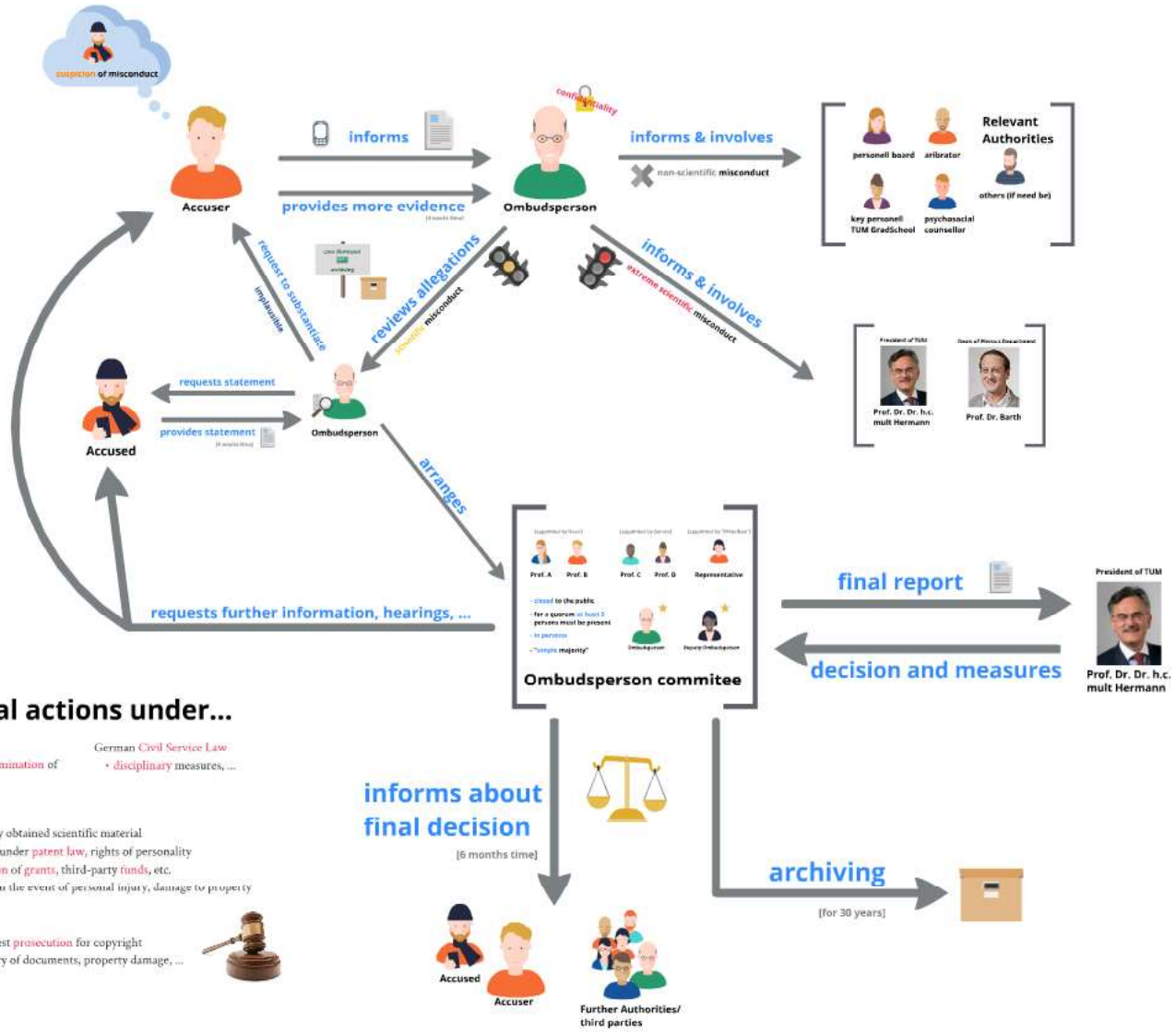
Prof. em. Joachim Heinzl

Deputy Ombuds person

Prof. em. Angelika Görg

ombudsperson@tum.de

Research Integrity Office TUM



Potential actions under...

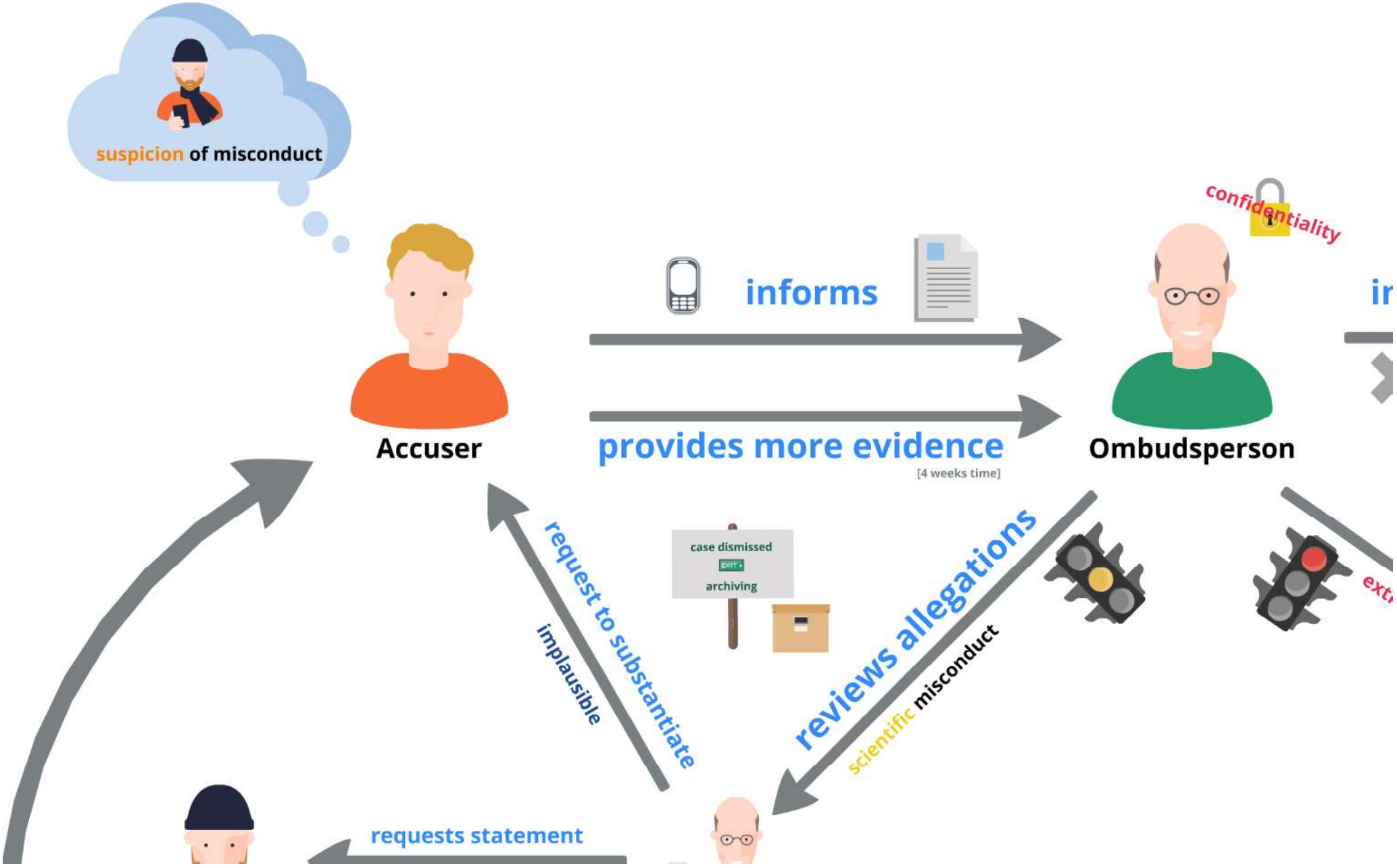
Employment Law
- offcial warnings, termination of employment, ...

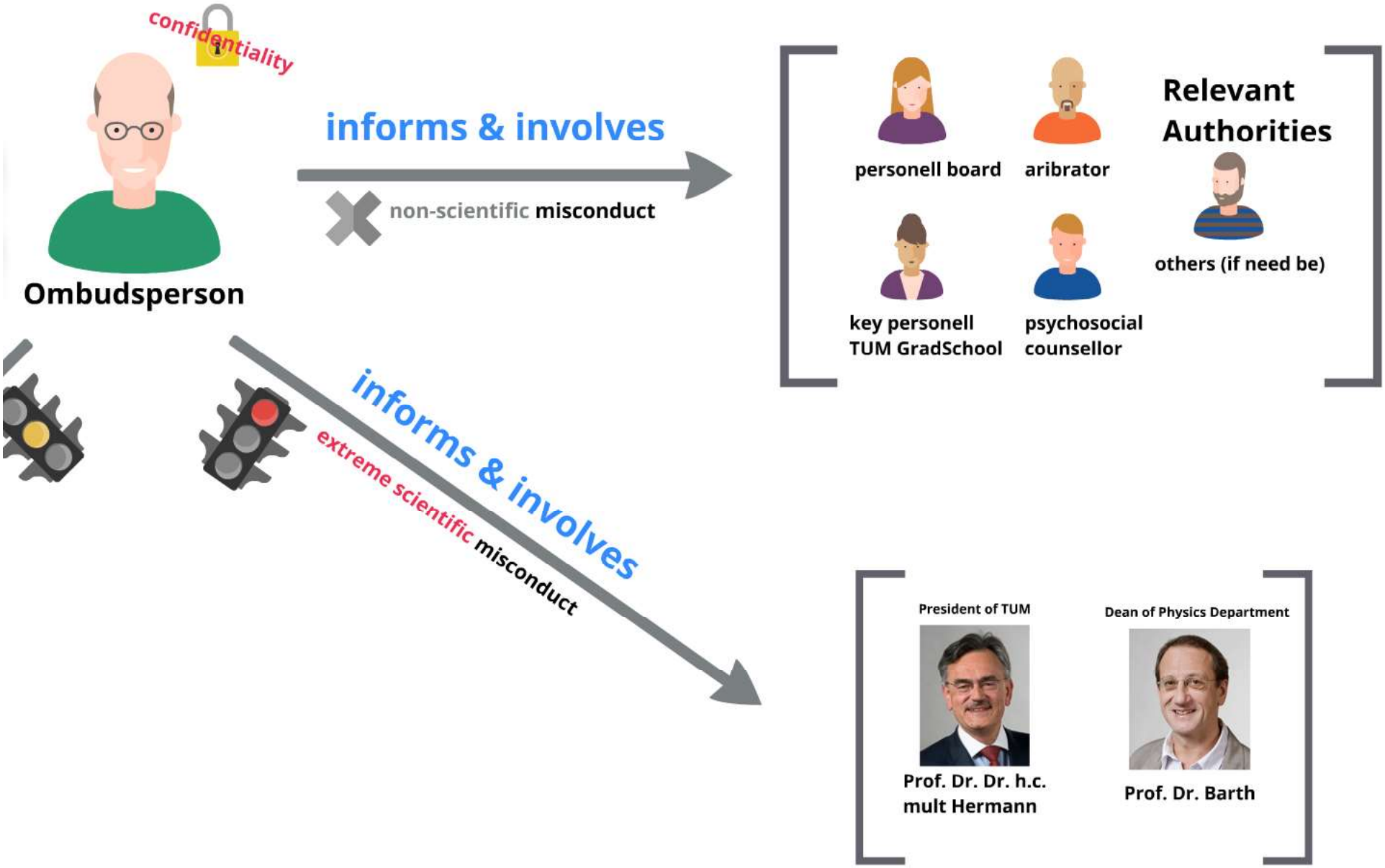
German Civil Service Law
- disciplinary measures, ...

Civil Law
- surrender unlawfully obtained scientific material
- request for removal under patent law, rights of personality
- request for restitution of grants, third-party funds, etc.
- claims for damages in the event of personal injury, damage to property

Criminal Law
- bring charges/ request prosecution for copyright infringement, forgery of documents, property damage, ...

Ombuds Process


suspicion of misconduct
Accuser
informs
provides more evidence
[4 weeks time]
confidentiality
Ombudsperson
case dismissed
EXIT
archiving
request to substantiate
implausible
reviews allegations
scientific misconduct
requests statement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informs & involves
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Ombudsperson
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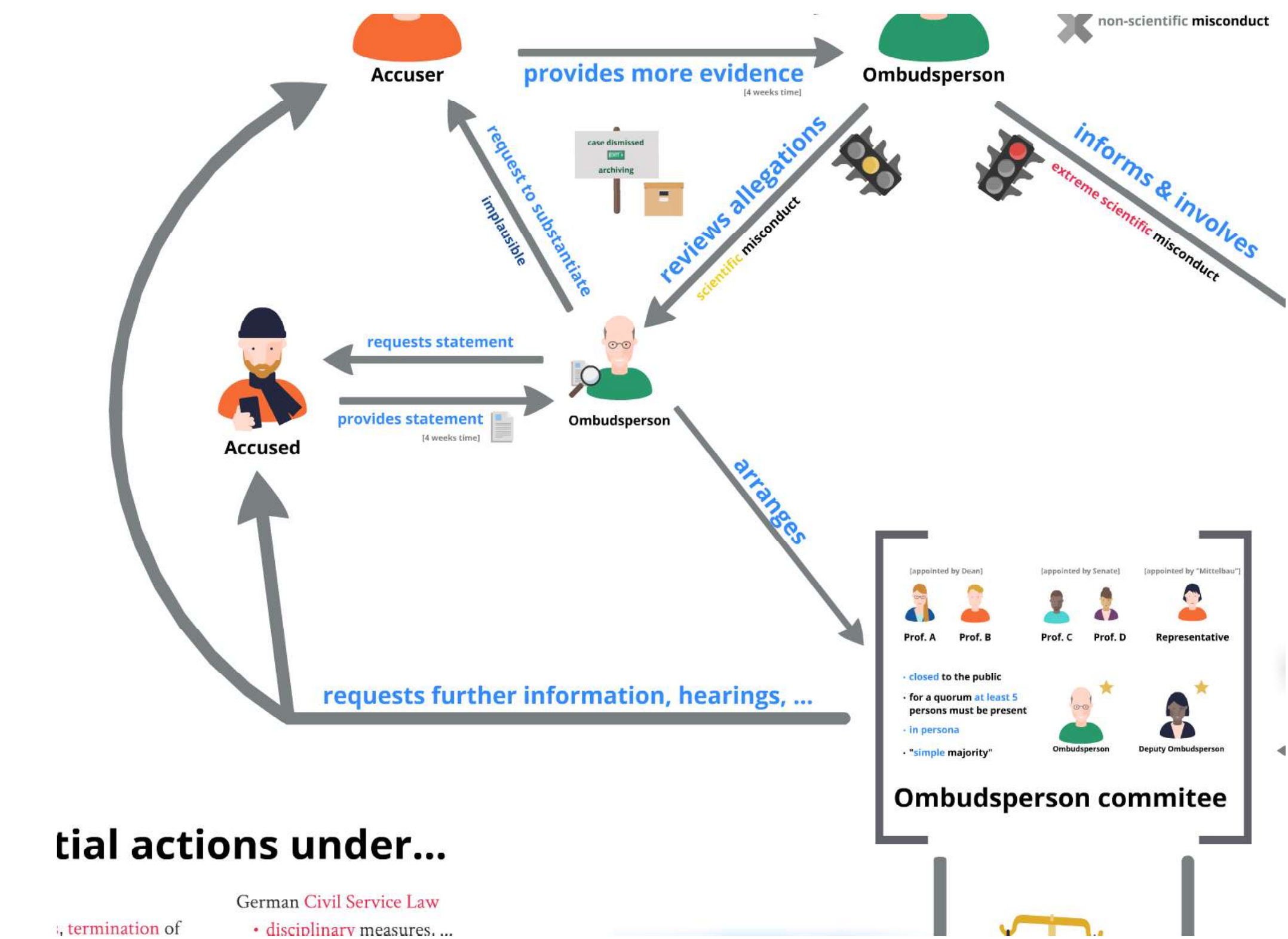
key personell TUM GradSchool
psychosocial counsellor
informs & involves
extreme scientific misconduct
President of TUM
Prof. Dr. Dr. h.c. mult Hermann
Dean of Physics Department
Prof. Dr. Barth



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German Civil Service Law

, termination of

• disciplinary measures, ...

[appointed by Dean]

Prof. A

Prof. B

[appointed by Senate]

Prof. C

Prof. D

[appointed by "Mittelbau"]

Representative

- closed to the public
- for a quorum at least 5 persons must be present
- in persona
- "simple majority"

Ombudsperson

Deputy Ombudsperson

Ombudsperson commitee

arranges

on, hearings, ...

[appointed by Dean] [appointed by Senate] [appointed by "Mittelbau"]

Prof. A Prof. B Prof. C Prof. D Representative

- closed to the public
- for a quorum at least 5 persons must be present
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Ombudsperson Deputy Ombudsperson

Ombudsperson commitee

final report

decision and measures

President of TUM

Prof. Dr. Dr. h.c. mult Hermann

informs about final decision

[6 months time]

Accused

Accuser

Further Authorities/ third parties

archiving

[for 30 years]

Potential actions under...

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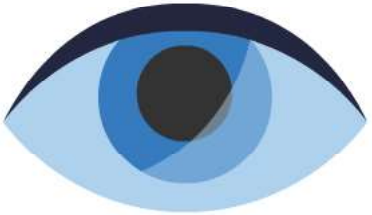

Good luck with your Ph.D. projects!

Questions ?