

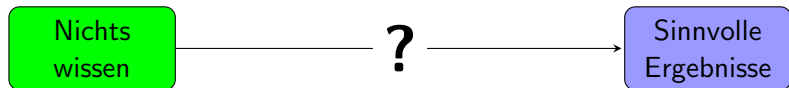
# GYPT Tutorial 02

Ein Problem Angehen

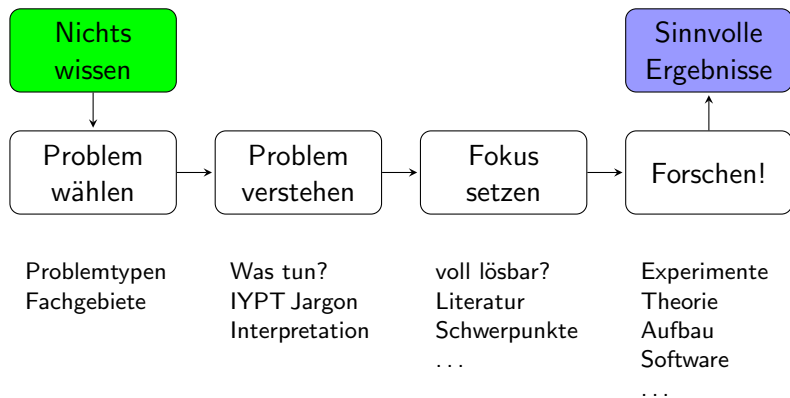
Felix Wechsler

September 17, 2015

# Ziel dieses Tutorials



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# Ein Problem auswählen

Es bietet sich an, ein einziges Problem auszuwählen

- Probleme sind Geschmackssache
- Probieren geht über Studieren!
- Lieber experimentell oder theoretisch?



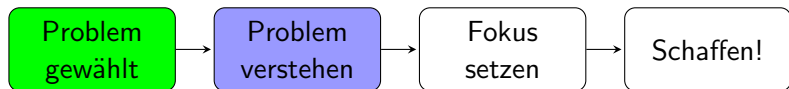
- Im Zweifel: Roll 1d17

Einfachere Anfängerprobleme: 1 Invent Yourself, 3 Acoustic Lense, 8 Magnetic Train, 10 Light Rings, 13 Paper Vice, 15 Contacless Calliper

Als Beispiel folgend: 13 Paper Vice

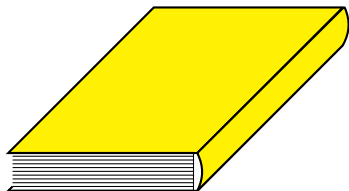
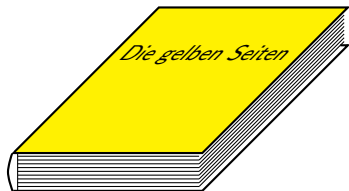
## 13 Paper Vice

Take two similar paperback books and interleave a few pages at a time. Push the books together. Hold the two books by their spines and try to pull them apart. Investigate the parameters that set the limits of being able to separate the books.



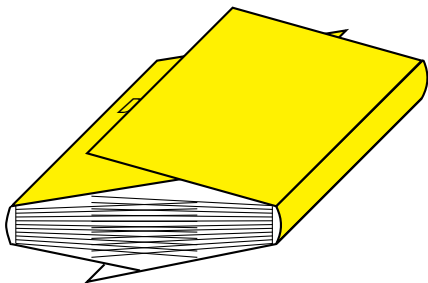
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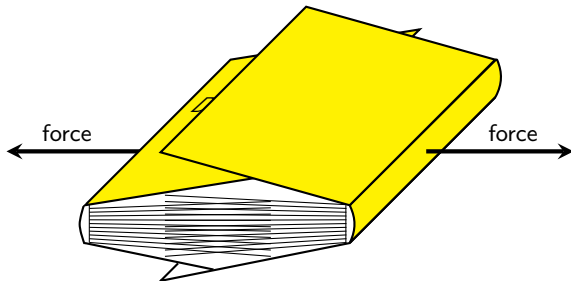
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- amounts of pages
- friction between pages

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- amounts of pages
- friction between pages
- area of one page

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- ...

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experimental setup



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experimental setup

- start with easy setup

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experimental setup

- start with easy setup
- a idealized book with a few pages ( $\approx 10 - 20$ )

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experimental setup

- start with easy setup
- a idealized book with a few pages ( $\approx 10 - 20$ )
- measure the force of pulling

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experimental setup

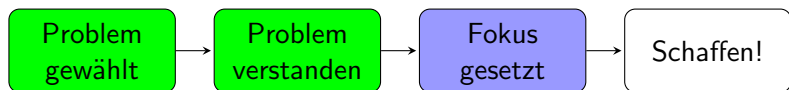
- start with easy setup
- a idealized book with a few pages ( $\approx 10 - 20$ )
- measure the force of pulling
- systematic change of the parameter

## 13 Paper Vice

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Formulierung	allgemeines Verständnis
Study [...]	Systematisches Durchmessen
Can one do [...]	Ist [...] möglich? Warum (nicht)?
Build [...]	Bau [...], oft Optimierung etc.
Explain [...]	Theoretischer Ansatz erwartet
Investigate [...]	Schau mal, was rauskommt...

# Schwerpunkte setzen



IYPT Probleme sind *offen* und meist *nicht komplett lösbar*.

Schwerpunkte setzen ist Erfahrungssache, Tipps:

- Grundlagen immer untersuchen, vortragen
- Experimente sind meist einfacher vorzustellen
- Neue Erkenntnisse sind besser, aber nicht immer möglich
- Literatur kann auch falsch sein! (sehr gut)
- Eigenbeiträge gut herausarbeiten

# Schwerpunkte setzen nach Literatur

Viele Theoriepaper, wenig Experimente veröffentlicht

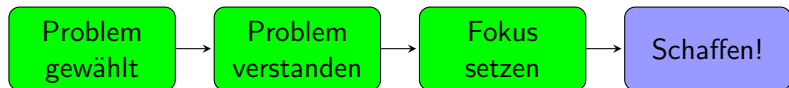
- Theorie Grundlagen selbst herleiten, Rest zitieren
- Eigenbeitrag ist experimentelle Verifikation
- eventuell Vergleich der Theorien, kleine Verbesserungen

Wenig Theoriepaper, viel Experimente veröffentlicht

- Experimente nachmachen, eventuell besser
- Theorie entwickeln und mit Daten vergleichen
- Warum ist die Theorie schwer zu entwickeln?  
Vereinfachungen und deren Einfluss

Andere Situationen: Nach Bauchgefühl. Nichts ist falsch.

# Schaffen!



## Projektarbeit auf verschiedenen Stufen

- einfach Einleitende Experimente, wichtige Abhängigkeiten  
Literaturrecherche, Theorieansätze
- mittel Systematisches Durchmessen  
Theorie verstehen, teilweise herleiten
- hart Automatisierter Aufbau bei experimentellen Problemen  
Eigene Theorie, passt zu Experimenten
- ultra Aufbau schickt Mails wenn er fertig ist  
Theorie verbessert und verallgemeinert



# Schaffen! Nützliche Ressourcen & Programme

Wo bekomme ich was? Was messe ich wie?

## **Betreuer und Mentor fragen!**

- Literatur: Interne Sammlung bei Betreuern
- Spezielle Messinstrumente (Highspeed)
- Videoauswertung (openCV, Tracker)
- Gnu Octave, SciPy, Mathematica, Matlab
- Simulation, Programmierung allgemein
- Automatisierung (Arduino, Raspberry)
- LabVIEW und Hardware, CASSY
- L<sup>A</sup>T<sub>E</sub>X Präsentationen
- ...