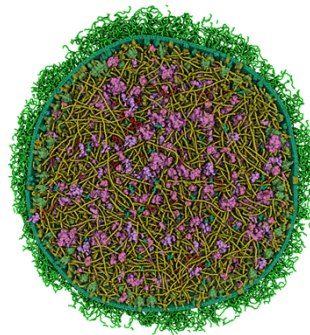
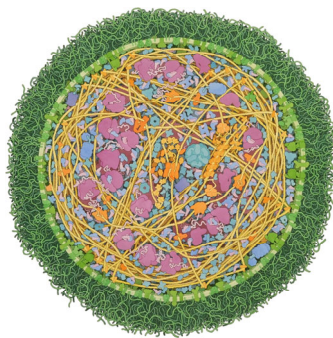
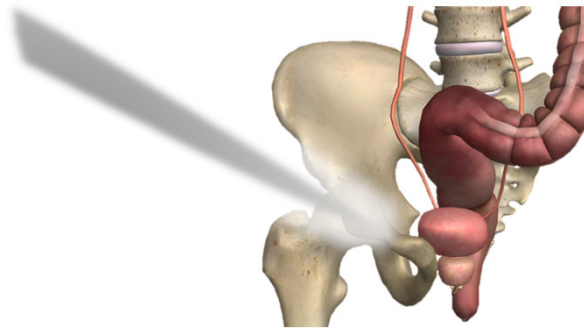


# How to do a Successful PhD (in Visual Computing)

Eduard Gröller

Institute of Visual Computing &  
Human-Centered Technology,  
TU Wien, Austria



# The Vis-Group at TU Wien

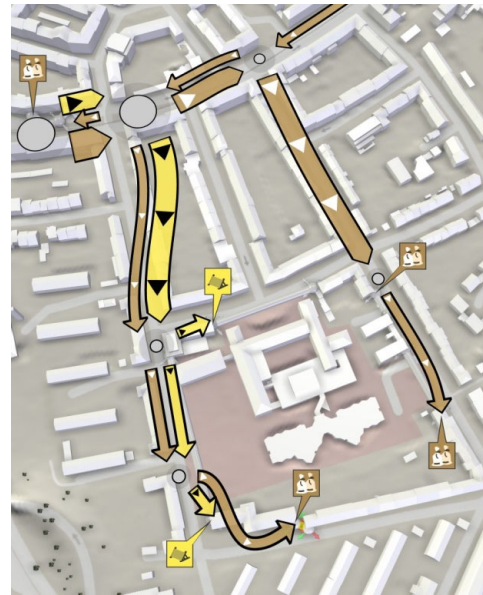
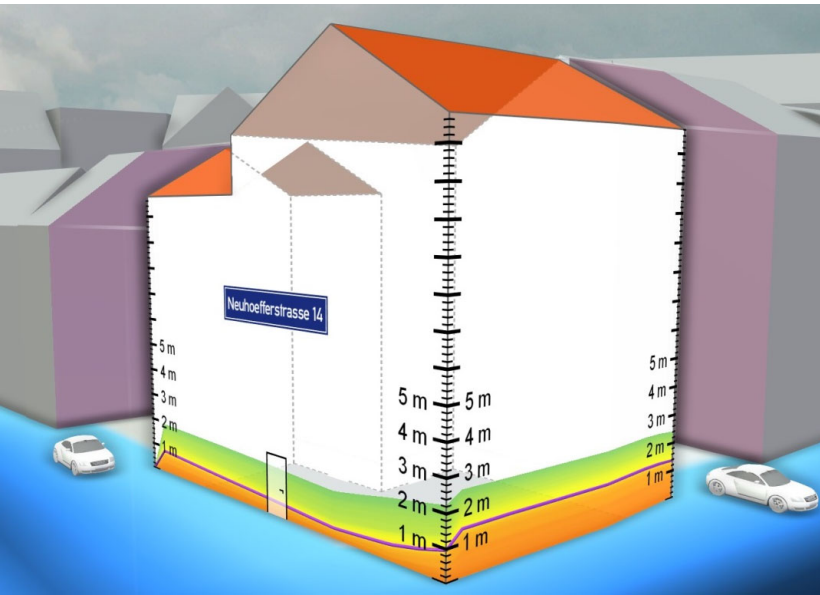


# Research Topics in the Vis-Group

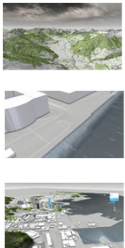
- Medical Visualization
- Mathematical Visualization
- Visual Modelitics of DNA Nanostructures
- Molecular Visualization
- Graph Visualization
- Perception in Visualization
- AI explainability







# Interactive Visualization of Simulation Data for Geospatial Decision Support



Daniel Cornel

VRVis Forschungs-GmbH  
Vienna, Austria

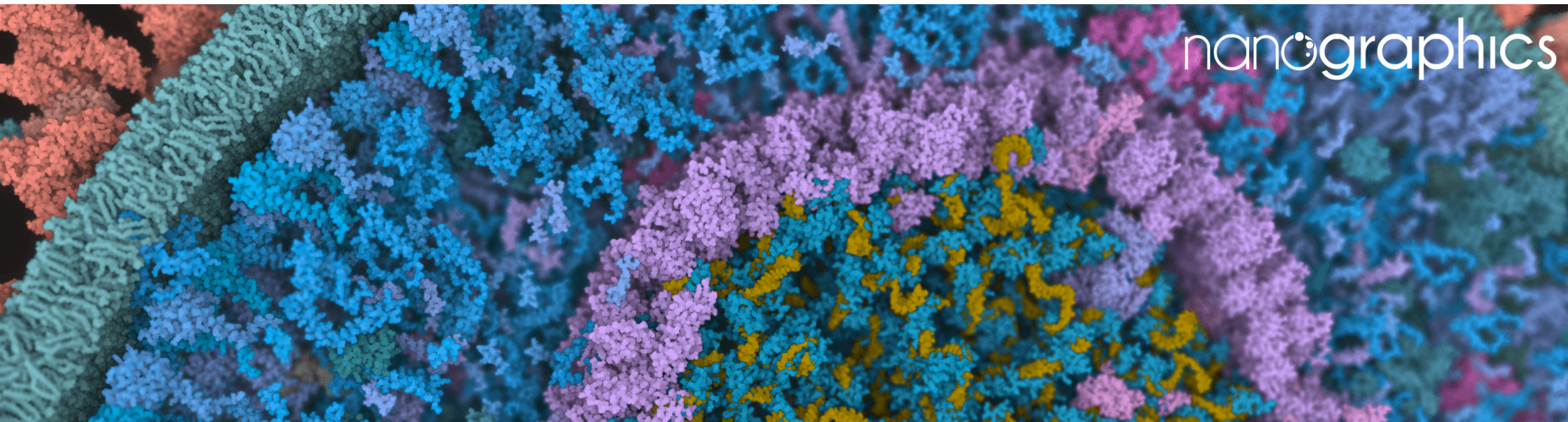


# Instant Construction of Atomistic Models for Visualization in Integrative Cell Biology

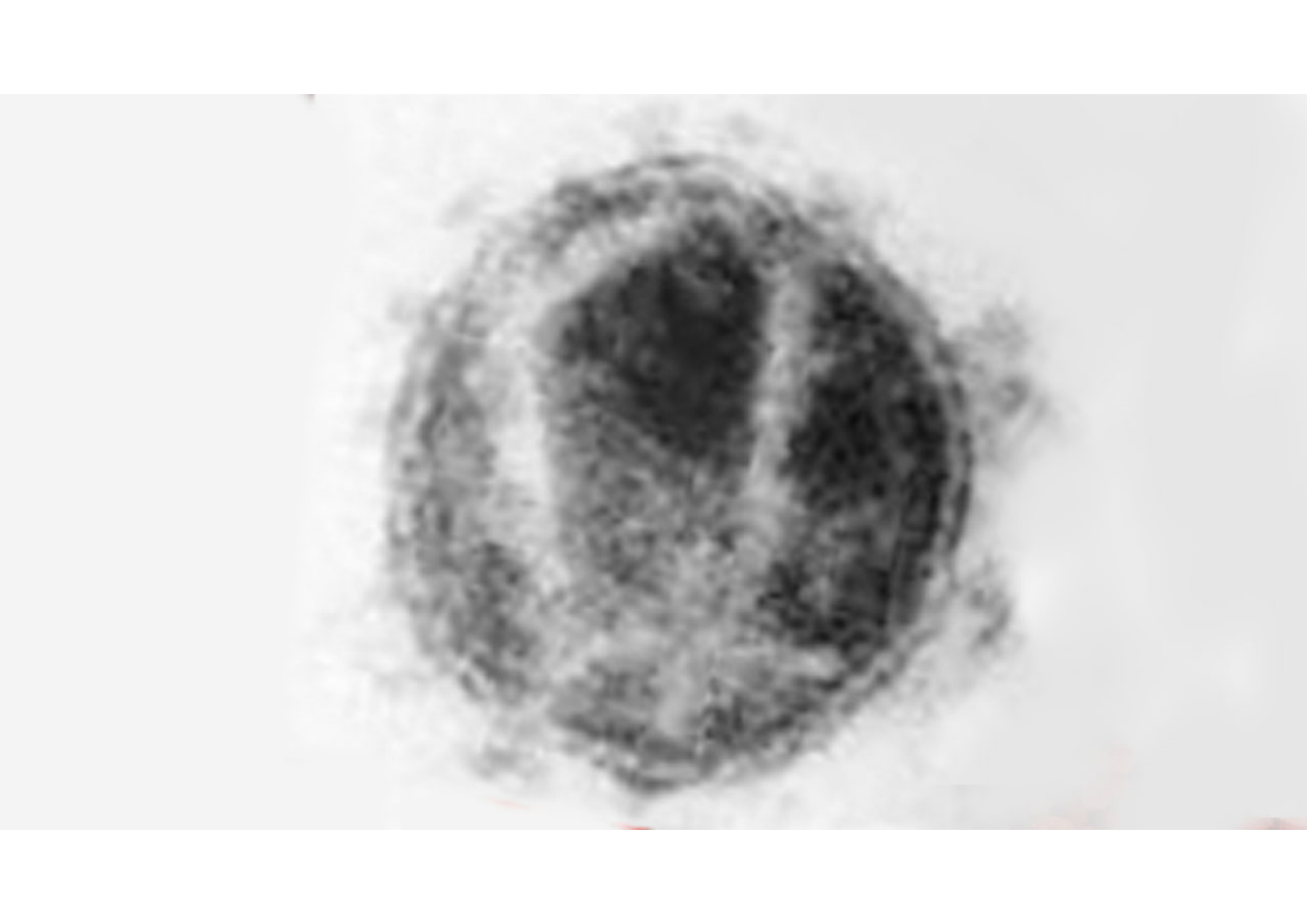
Tobias Klein

Institute of Visual Computing and Human-Centered Technology

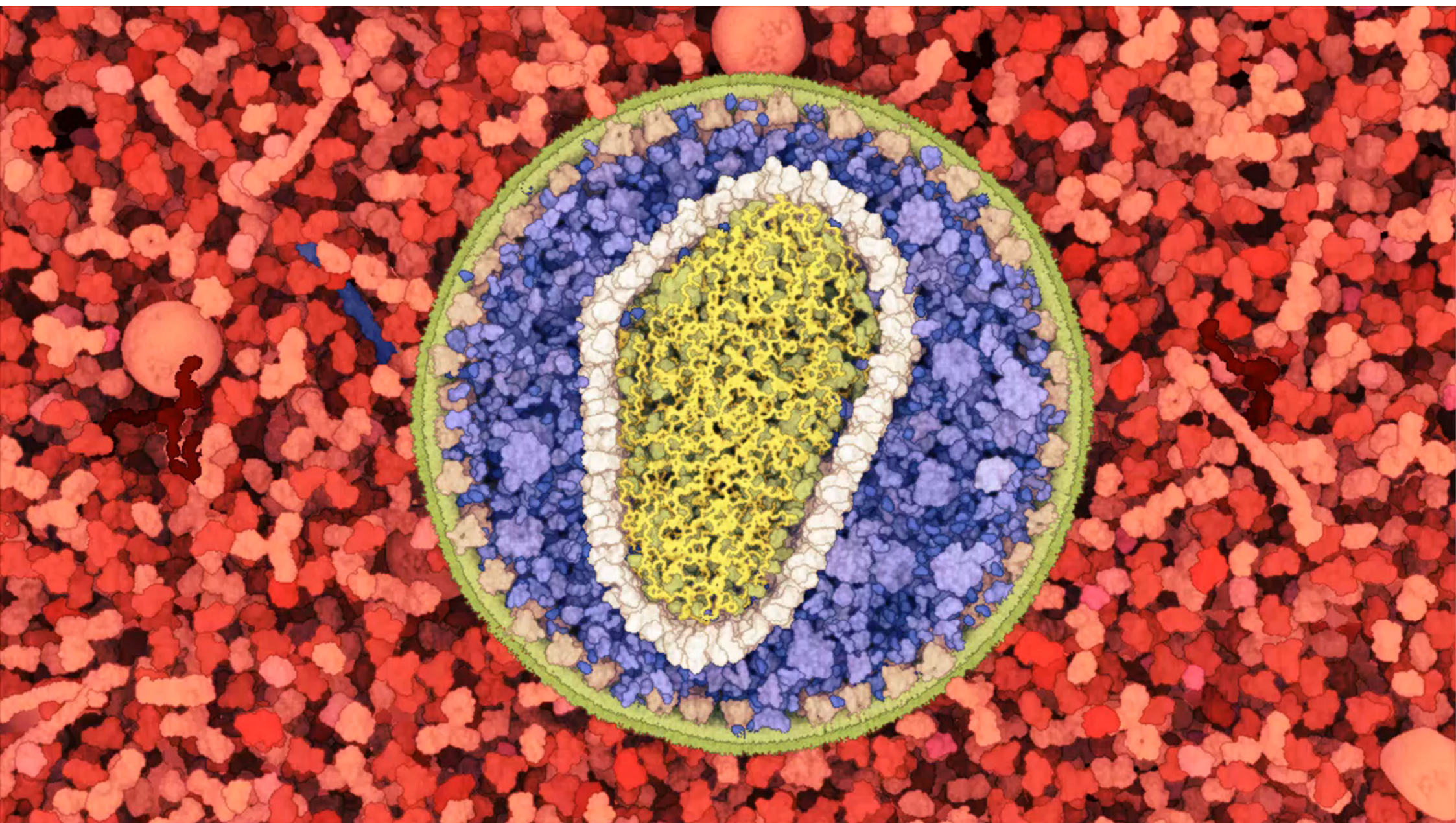
TU Wien



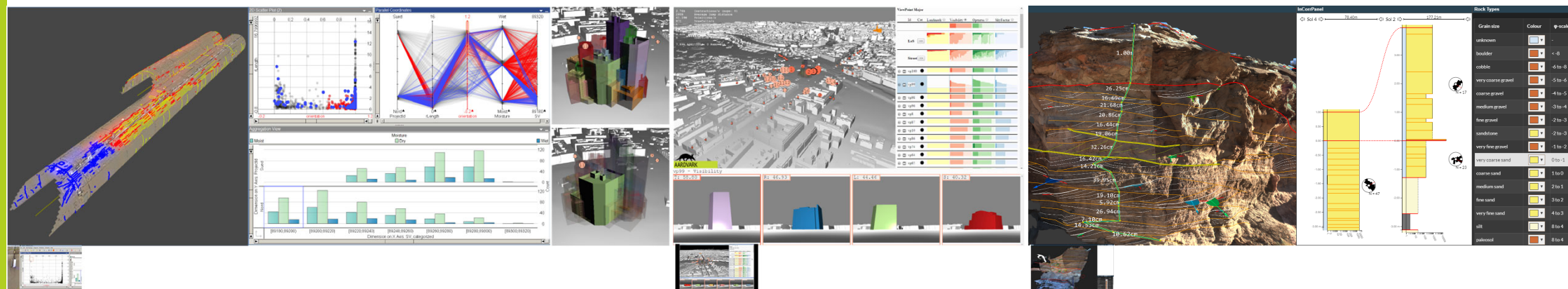












# Tight Integration of Visual Analysis and 3D Real-Time Rendering

Thomas Ortner

VRVis Research Center, Vienna, Austria





- Why to do a PhD?
  - ~~Money~~
  - ~~Reputation~~
  - ~~Job opportunities~~
  - Scientific curiosity
- How to get a PhD? [Peter Eades]
  - Find a good topic
  - Find a good supervisor
  - Use a good research method
  - Give lots of good talks
  - Write lots of good papers
  - Write a good thesis



"If we knew what it was we were doing,  
it would not be called research, would it?"

[Albert Einstein]

- Doing a PhD is a
  - highly unstructured process
  - underspecified task
- Structuring
  - Divide and conquer
  - Anchor your work in a local research group
  - Get connected in international reseach community





# Divide and Conquer

- Subdivide your three-year PhD endeavour
  - State-of-the-art (6 months)
  - 4-5 research subprojects (6 months each)
  - Write-up thesis, wrap-up results (6 months)
- For each subproject define
  - Problem
  - Goal
  - Approach
  - Outcome
  - Cost
- Define Milestones



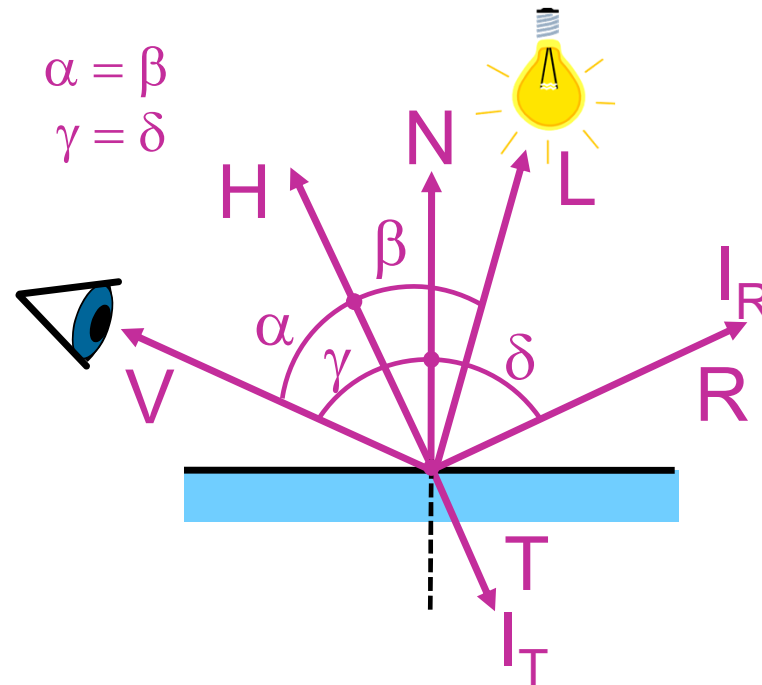
To steal ideas from one person is plagiarism –  
to steal from many is research [Steven Wright]

- Regular meetings with advisor
- Expose your ideas early on to your local peers
- Attend scientific meetings from early on
  - Local conferences
  - International conferences
- Attend talks, tutorials
- Try to give many talks
- Use every opportunity to talk to your (international) colleagues

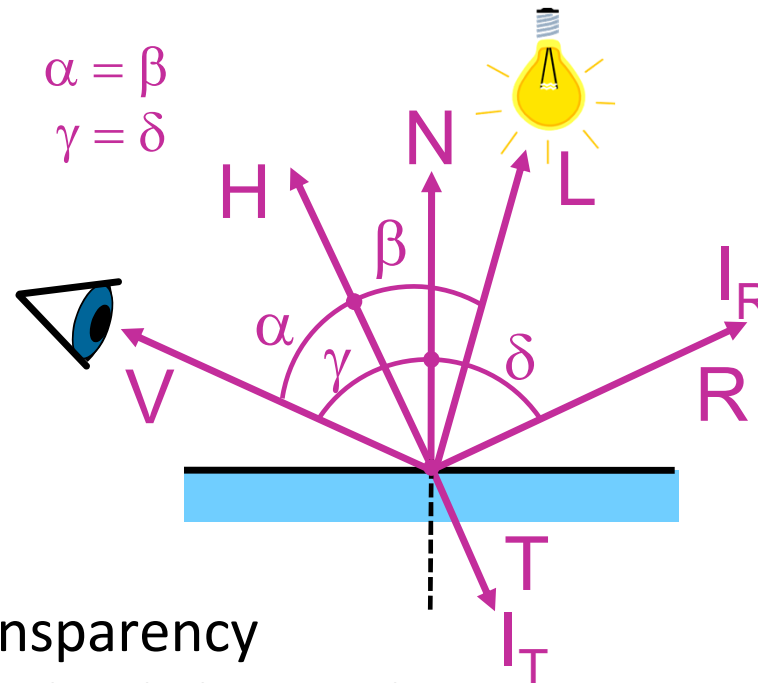




# Reflection and Transparency



# Reflection and Transparency

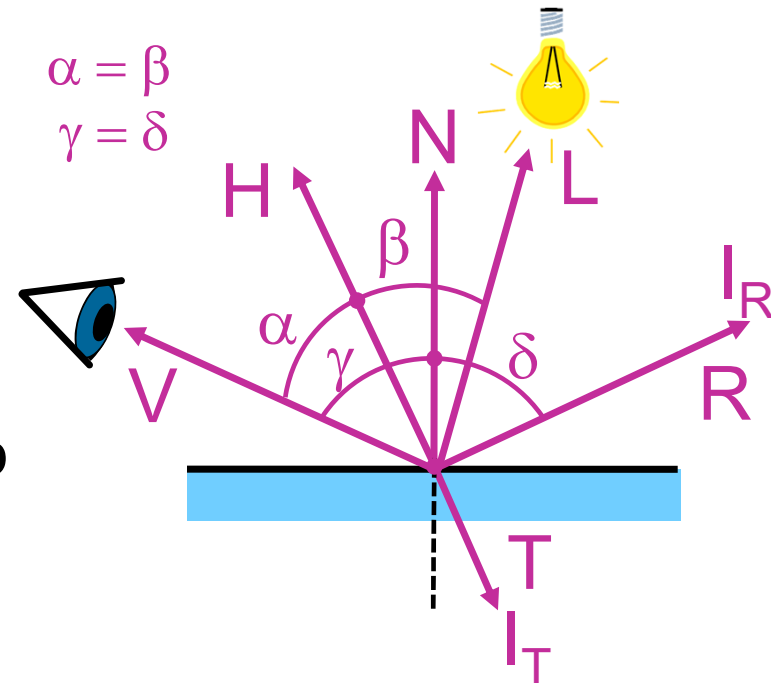


- Transparency
  - Clearly know what you are doing
  - Clearly communicate to others
- Reflection
  - By yourself
  - Get feedback from others





- Internally, externally
- Everything is peer based
  - Peer reviewing
  - Peer learning
  - Supervisor learns as much as you do
- Be sincere to yourself and to others
- Evaluation is key [Peter Eades]
  - Effectiveness
  - Efficiency
  - Elegance





# Failure is the Key to your Success ??

If you can look into the seeds of time,  
And say which grain will grow and which will not,  
Speak then to me ... [William Shakespeare]

- The landscape of the known is convoluted
- In hindsight everything looks straightforward and simple
- The path to scientific discovery is tangled
- Learn from errors (from your own, from others)
- If you cannot fail you cannot succeed



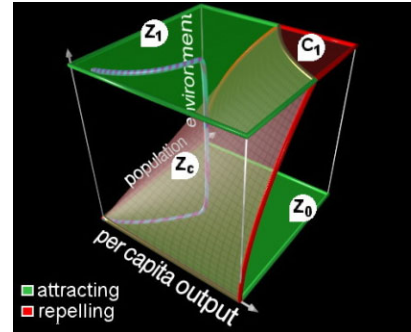
And sometimes you fail because it is your fault !!!





# Three Failure Stories from the Vis-Group

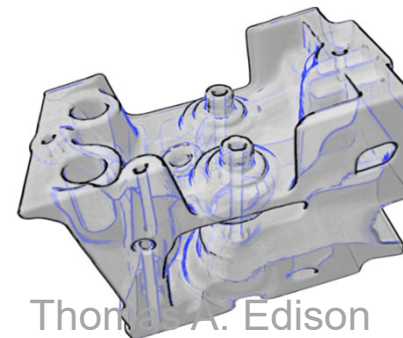
- Project proposal on dynamical systems



- Depth-of-Field for Volume Rendering



- Semantic layers for Illustrative Vol. Rend.

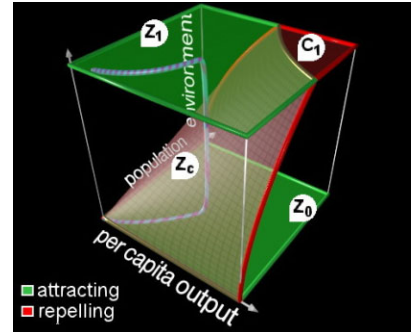


Thomas A. Edison



# Three Failure Stories from the Vis-Group

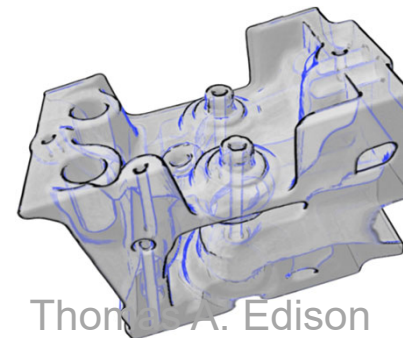
- Project proposal on dynamical systems



- „In my opinion this work is a significant step backwards“

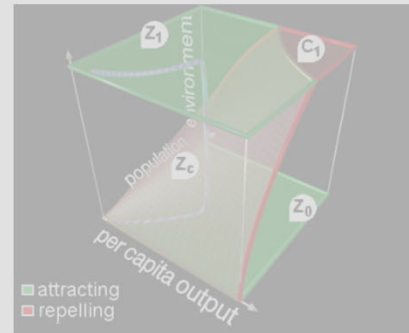
[anonymous reviewer]

- Semantic layers for Illustrative Vol. Rend.



# Three Failure Stories from the Vis-Group

- Project proposal on dynamical systems

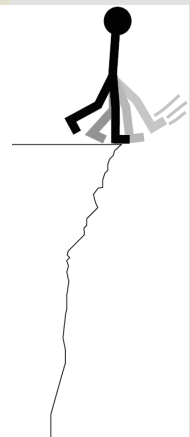


- „In my opinion this work is a significant step backwards“

[anonymous reviewer]

I have not failed.  
I've just found 10,000 ways that won't work.

Thomas A. Edison





# The Most Valuable Resource for your PhD?

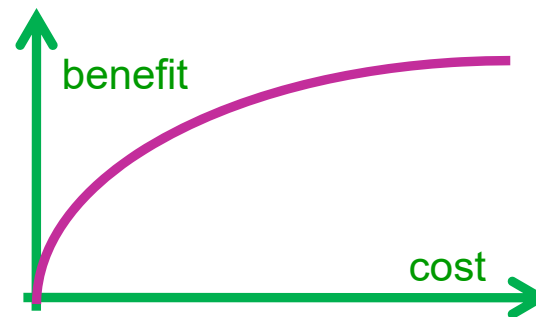


# The Most Valuable Resource for your PhD?

- Stay focused and dedicated
- Act as problem solver
- The result not the amount of work counts
- Solutions: trivial – complicated – simple
- Cost/benefit curve



It's you



# The Most Valuable Resource for your PhD?

- Stay focused and dedicated
- Act as problem solver
- The result not the amount of work counts
- Solutions: trivial – complicated – simple
- Cost/benefit curve



It's you



Genius is one percent inspiration and ninety-nine percent perspiration. [Thomas A. Edison]



# The Pareto Principle (80-20 rule)

- With 20% effort you achieve 80% of a goal
- The Pareto principle is a  **blessing**
  - Structured reading of papers
  - Keep a record of your research activities and ideas
- The Pareto principle is a  **curse**
  - Sometimes you have to care for the smallest details (110% is barely enough)

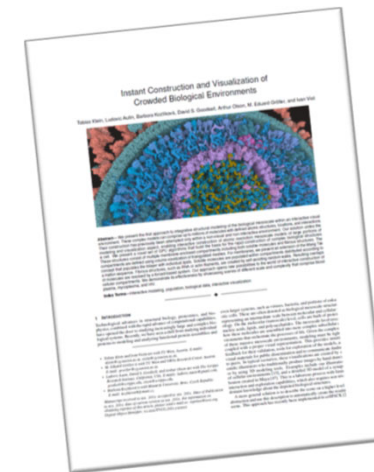
Make everything as simple as possible,  
but not simpler. [Albert Einstein]





# Learn to Write Good Scientific Papers

- Your papers have to tell a story
  - Something to tell
  - Somebody to address
- Hierarchical top down approach
  - Define section headings first
- Illustrative figures
  - Overview figure (as pictorial table of content)
  - Figures by themselves should tell the story
- Paper writing as a collaborative effort
- Review papers from others



- What is a good PhD student ?
  - Curiosity and playful thinking
  - Know your tools
  - Analytic reasoning, abstracting
  - Creativity
  - Learning on the job
  - Stay focused and dedicated
  - Resilience, Frustration Tolerance
- What is a good PhD advisor ?
  - Interested in your research work
  - Scientifically well connected
  - Provides continuous support, stimulating environment
  - Supports the runners-if (self-runners, runners-if, never-runners)



- What is a good PhD student ?

- Curiosity and playful thinking
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- I

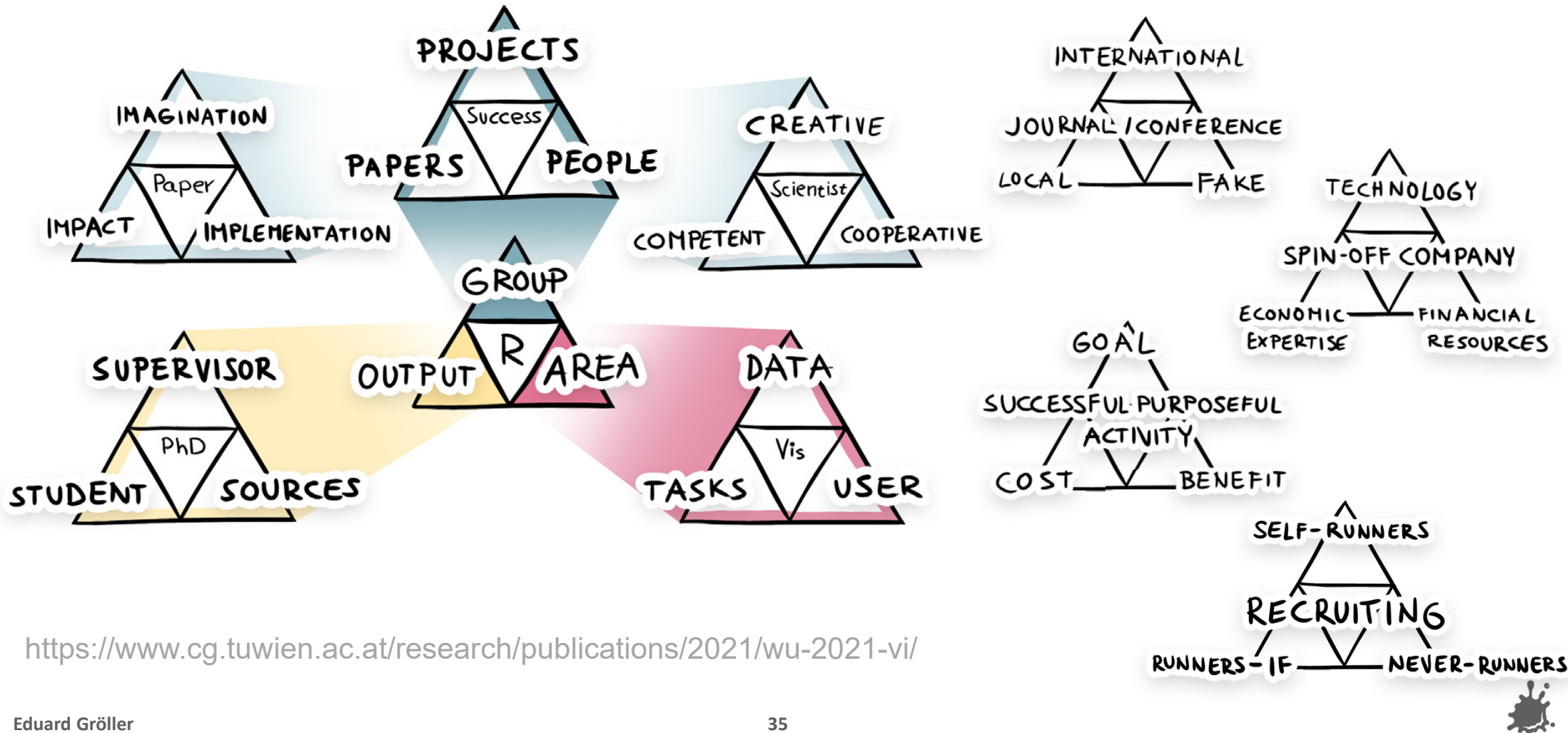
First class people hire first class people,  
second class people hire third class people,  
and third class people hire fifth class people.

- What

- Interested in your research work
- Scientifically well connected
- Provides continuous support, stimulating environment
- Supports the runners-if (self-runners, runners-if, never-runners)



# Trinities - How to Run a Successful Research Group?



<https://www.cg.tuwien.ac.at/research/publications/2021/wu-2021-vi/>





# Vis-Group Specifics

- Group has distinct identity
- Tight professional interaction
  - Weekly meetings in the group
  - Regular meetings with supervisor
  - Yearly closed meeting
  - Joint deadline frenzies
- Tight social interaction
  - Joint lunches
  - Going for a fast beer
  - Rejection parties
- Senior PhD students act as role models
- International composition



VISIBILE FACIMVS  
QVOD CETERI NON POSSVNT



- Solve relevant problems and enjoy your work

## ■ References

- Wu et al.: **Visualization working group at TU Wien: Visible Facimus Quod Ceteri Non Possunt**; [doi.org/10.1016/j.visinf.2021.02.003](https://doi.org/10.1016/j.visinf.2021.02.003)
- Patel et al.: **PhD Education Through Apprenticeship**; [doi.org/10.2312/EG2011/education/023-028](https://doi.org/10.2312/EG2011/education/023-028)
- Gröller et al.: **Practical Tips and Tricks for Paper Writing**; <https://www.cg.tuwien.ac.at/research/publications/2010/groeller-2010-PTT/>

I never did a day's work in my life.  
It was all fun. [Thomas A. Edison]

