How to write a high-quality paper

Preprint · July 2020

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How to write a high-quality research article

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I thank you …

Stephane Bordas
Prof at University of Luxembourg

Lambertus Sluys
Prof at Delft Uni. of Technology

Martijn Stroeven
Delft Uni. of Technology

Alban de Vaucorbeil
Deakin University

Agenda

what is the **problem**?
general guidelines to writing
title/abstract/introduction/conclusion/acknowledgement
references
tables/figures
how to write a paragraph
some *mistakes*
writing work flow
LaTeX

and possibly QA/discussion

Have you read any papers lately?

lack the technical sophistication?

No! so many papers are **poorly written**

Judy Swan – Associate Director for Writing in Science and Engineering at Princeton University – said: '**scientific writing is bad writing**'

https://www.youtube.com/watch?v=1pzjxYCwb08

If you can write clear, accessible papers…

get accepted **quicker** as reviewers worked on the content

people will enjoy reading them

people will learn **something from them**

your papers are likely got **high citations**

learning to write well is an **essential part** of becoming a successful researcher

General guidelines

To **inform** not to impress
Aim for **clarity** and **readability** and **reproducibility**
Contributions must be clearly stated
Every unit of discourse (a sentence/section/article): only a **single idea**/message
Avoid jargon
Minimize chances for reviewers to raise issues
Clarity > grammatical exactness
If you can remove a word/sentence/figure, do it

G. D. Gopen and J. A. Swan. The science of scientific writing. American Scientist, 78(6):550–558, 1990
https://www.nature.com/scitable/ topicpage/scientific-papers-13815490/

Explain everything

choose a method: **explain why**
choose a test/example: **explain why**
value for parameters: sources and if you come up with them, **explain why**
provide **all parameters** needed to reproduce your paper

Topology optimization is a method that allows to find an optimal material layout within a prescribed design domain so as to maximize or minimize certain objectives and satisfying one or multiple design constraints [1]. …

Various techniques have been developed for topology optimization, for example, the solid isotropic material with penalization (**SIMP**) method [2] and the evolutionary structural optimization (**ESO**) method [3] and its improved version – the bi-directional evolutionary structural optimization (**BESO**) method [4]. ***We choose the BESO method for our work for the following reasons***. First, without needing calculating sensitivities, the BESO is much easier to implement and can be easily adapted to a wide range of problems. Second, engineers only care whether the design can be improved, but do not care whether the solution is optimal or has rigorous mathematical foundation. **We refer to the review of [5] for a discussion on the merits of existing topology optimization methods**.

Structure of a research article

Title
Abstract
Introduction
Method
Result
Conclusion
Acknowledgement
Appendices
References

The title: why do paper titles matter?

the title is the part of a paper that is **read the most**
it is usually **read first**
*papers with **short titles** got more citations*
*using a **question mark** in a paper's title reduces the citations*
*using a **colon** tended to improve the citations*
for many researchers: never mind

'The nucleotide sequence of a 3.2 kb segment of mitochondrial maxicircle DNA from Crithidia fasciculata containing the gene for cytochrome oxidase subunit III, the N-terminal part of the apocytochrome b gene and a possible frameshift gene; further evidence for the use of unusual initiator triplets in trypanosome mitochondria' by P. Sloof, J. van den Burg, A. Voogd, R. Benne Nucleic Acids Research, Volume 15, 1987

C. E. Paiva, J. P. d. S. N. Lima, and B. S. R. Paiva. Articles with short titles describing the results are cited more often. Clinics, 67(5):509–513, 2012

https://www.timeshighereducation.com/news/long-research-titles-have-lower-impact

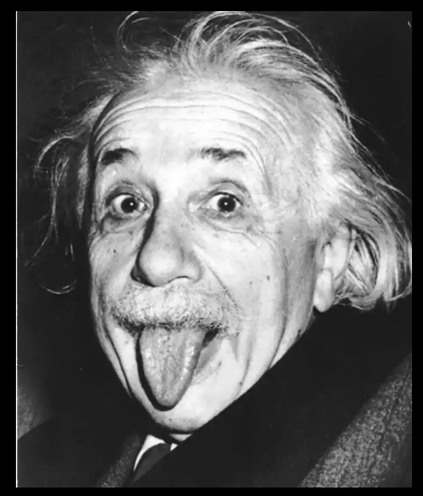
Titles from the old great minds

On Quaternions; or on a new System of Imaginaries in Algebra. By* Sir William Rowan Hamilton, *LL.D., P.R.I.A., F.R.A.S., Hon. M. R. Soc. Ed. and Dub., Hon. or Corr. M. of the Royal or Imperial Academies of St. Petersburgh, Berlin, Turin, and Paris, Member of the American Academy of Arts and Sciences, and of other Scientific Societies at Home and Abroad, Andrews' Prof. of Astronomy in the University of Dublin, and Royal Astronomer of Ireland.*

On the Movement of Small Particles Suspended in Stationary Liquids Required by the Molecular-Kinetic Theory of Heat

On the Electrodynamics of Moving Bodies

On the Influence of Gravitation on the Propagation of Light



The title: what makes a good title?

Indicate accurately the **subject/scope** of the study.
Avoid using abbreviations
Do not include "study of," "analysis of" or similar constructions.

An efficient and robust staggered ***algorithm*** **applied** to the quasi-static **description** of brittle fracture **by** a phase-field approach

⇒ An efficient and robust staggered solver for a phase-field model of quasi-static brittle fracture

General mesh method: A unified numerical scheme

⇒ General mesh method: A unified numerical scheme for fluid dynamics problems

Data-driven inverse modelling through neural network (**deep learning**) and computational heat transfer
⇒ Data-driven inverse modelling for heat transfer problems through neural network

The abstract

the **most important section** of your paper
the first section that is read by journal editors
once published, the first section that is examined by readers
in many cases, it is **the only section** of the manuscript that they will ever read

write the paper first, **abstract is the final part**
a **concise summary** of your paper
include: **background**, **gaps**, **methodology** and **results**

The abstract: an example

Fracture of hyperelastic materials such as synthetic rubber, hydrogels, textile fabrics is an essential problem in many engineering fields. *The computational simulation of such a fracture is complicated, but the use of phase field models (PFMs) is promising.* Indeed, in PFMs, sharp cracks are not treated as discontinuities; instead, they are approximated as thin damage bands. Thus, PFMs can seamlessly model complex crack patterns like branching, merging, and fragmentation. **However, previous PFMs for hyperelastic materials, which are mostly based on a PFM with a simple quadratic degradation function without any user-defined parameters, provide solutions that are sensitive to a length scale (that controls the width of the damage band)**. **The current practice of considering this length scale as a material parameter suffers from two issues**. First, such a calculated length scale.. Second … **This paper presents a length scale insensitive PFM for brittle fracture of hyperelastic materials**. *This model is an extension of the model of Wu [JMPS, 103 (2017)] with a rational degradation function. This function has some user-defined parameters of which one is defined to be inversely proportional to the length scale in such a way that the damage threshold (and thus maximum stress) is independent of the length scale*. Results of mode-I and mixed-mode fracture problems obtained with the method of finite elements are in good agreement with previous findings and independent of the discretization resolution. Most importantly, they are independent of the incorporated length scale parameter.

The introduction section

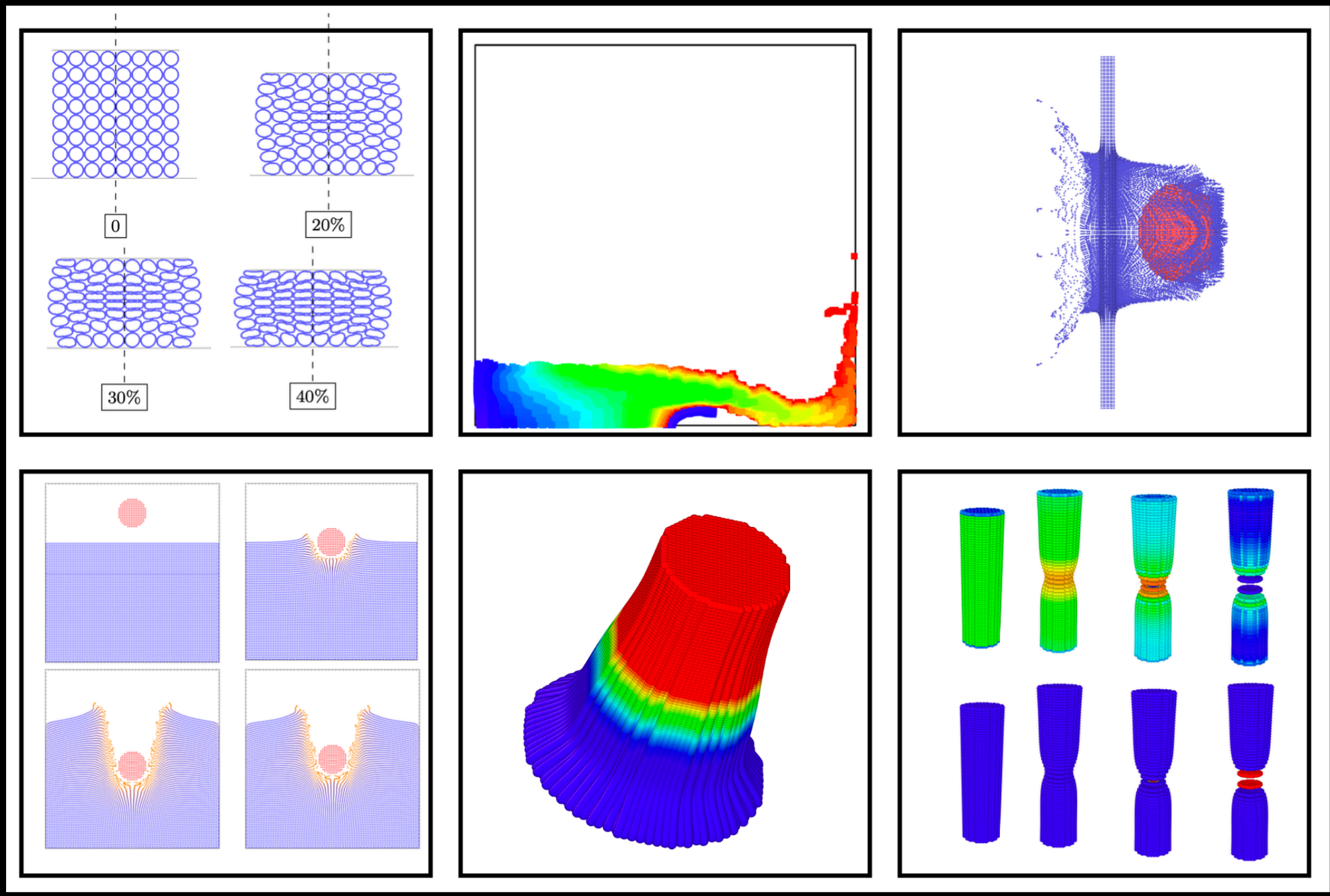
What is the **problem domain**
What is the **specific problem** that the paper is solving
Demonstration the **importance** of that problem
What are the **current approaches** to solving this problem
What is **wrong about them**
What are the **contributions of the paper**
Planning the readers for reading the subsequent sections

The introduction section: example

Material hardness values are often cited in manufacturing specifications and are used for quality control purposes. **Hardness tests** are usually convenient and economical to conduct and can often be classified as nondestructive. However, despite the fact that various types of hardness testing have been quantitatively conducted for over 150 years, **a fundamental, theoretical understanding of the test is, in many aspects, still lacking**. This is because the physical processes that occur during a hardness test are very complex although such tests are relatively easy to conduct. **Contemporary computational mechanics techniques and computer hardware have made it possible and practical to numerically model hardness tests**. The goal of such modeling is to obtain more information from the testing and thereby make the results more useful for validating the material models used for impact simulations. **Numerically modeling Brinell and Rockwell hardness testing of metals is the topic of this paper**.

Literature review …

The introduction section



a picture can engage the readers to continue reading your paper

ACTRESS
IN A LEADING ROLE

The conclusion

People often read the conclusions directly after the abstract

Do not repeat the abstract

Some journals skip the conclusions section

Avoid restating the problem/context

Highlight most significant things

State limitations/issues

The conclusion: one example

We have presented a new method for explicit solid dynamics within the framework of the material point method. Based on previous works developed in the MPM community, particularly the Convected Particle Domain Integrator, the total Lagrangian MPM and the finite element material point method, a Generalized Particle in Cell (GPIC) was presented with **the following attributes**:

- [?] Enables seamless enforcement of Dirichlet and Neumann boundary conditions; [?]
- Seamless treatment of material interfaces;
- Higher efficiency as fewer particles (or elements) can be used;

All of these are achieved with the introduction of a finite element mesh in a supposedly meshfree method. GPIC can be **an efficient tool for modeling multiple contact large deformation problem** (Fig. 28).

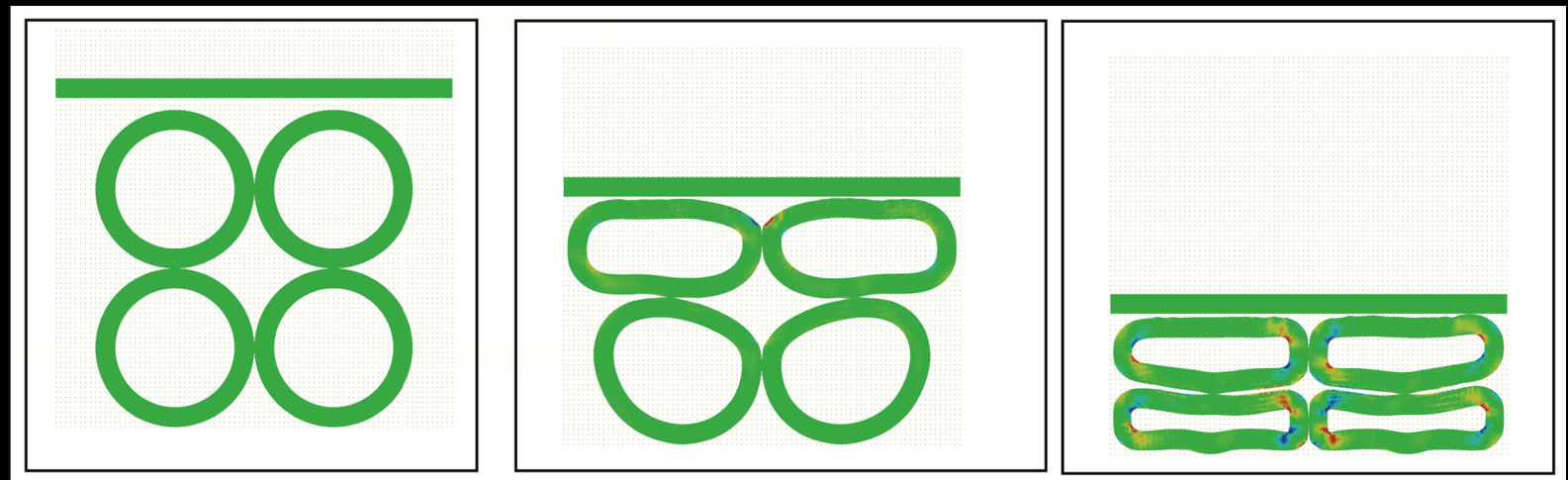


Figure 28: Compression of four identical rubber rings.

Although some good results were obtained, there are **many issues worthy of further investigation**. First, we have limited our discussion to… Second, only explicit time integration was considered due to its computational simplicity. This limits GPIC to fast transient dynamics problems. Third, we did not consider … We are working on some of these issues.

The acknowledgement

acknowledge the funding agents

acknowledge anyone helped you with the paper (not in the author list)

Acknowledgments

The first author (T.K. Mandal) thanks the Monash Graduate Scholarship and Monash International Tuition Scholarship for funding his PhD. The first author thanks Dr. Arun Raina (German Aerospace Center, Germany) for a very helpful discussion on fracture of biological tissues. The third author (J.Y. Wu) thanks the support of the National Natural Science Foundation of China (51878294; 51678246), the partial support from the State Key Laboratory of Subtropical Building Science (2018ZC04) and the Funding for Central Universities (2018PY20).

Acknowledgments

Vinh Phu Nguyen thanks the funding support from the Australian Research Council via DECRA project DE160100577. Tushar K. Mandal thanks the Monash Graduate Scholarship and Monash International Tuition Scholarship for funding his PhD. The authors would like to express the gratitude towards Dr. Erik Jan Lingen at the Dynaflow Research Group, Houtsingel 95, 2719 EB Zoetermeer, the Netherlands for providing support on the numerical toolkit `jive`.

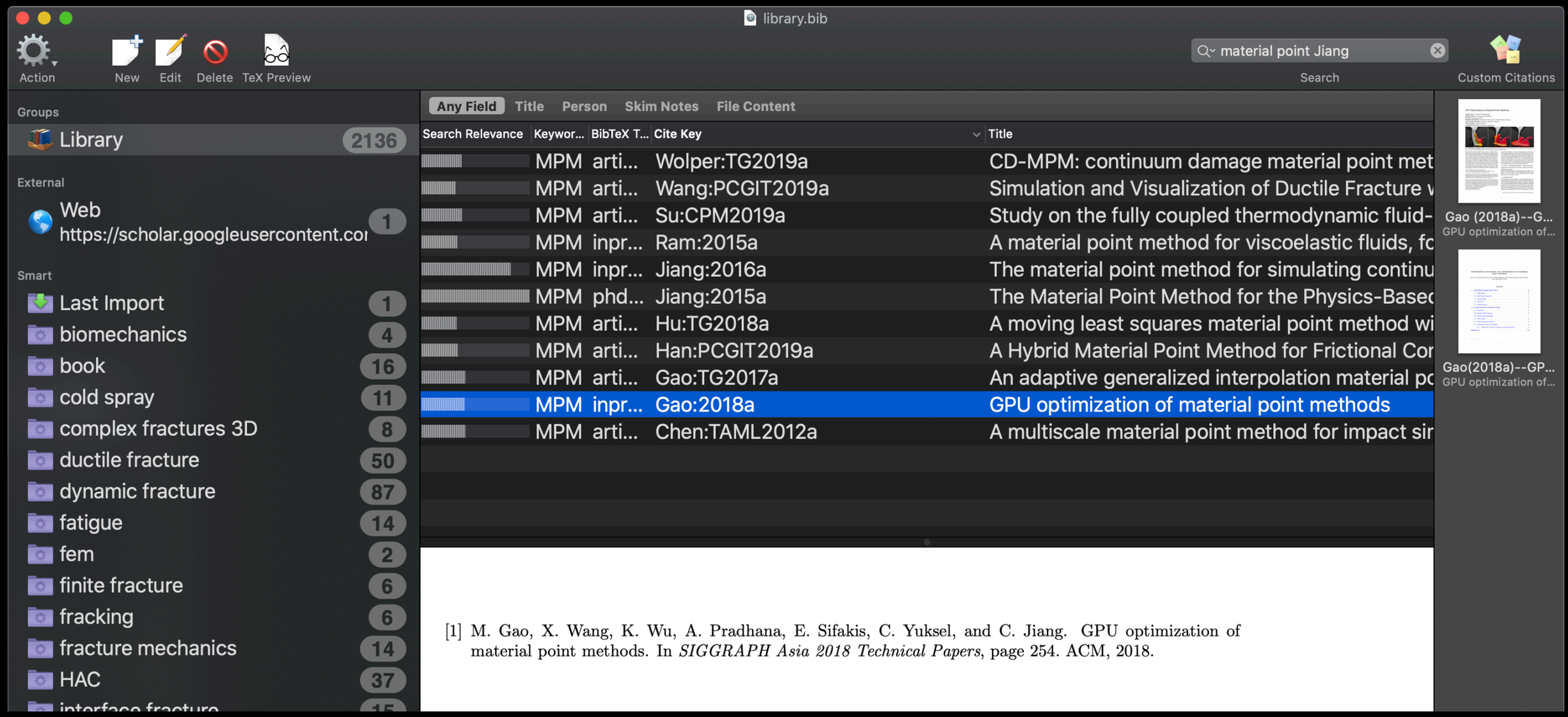
References and citation

Cite originals not derivatives

Avoid citing a **list of two many papers** e.g. ‘See [1-20] for some relevant work’. [?]

If a author-year reference format is used, all references in a single citation should be ordered in **chronological orders**: (Day, 1998; Ashby, 2000; Plaxco, 2010).’

References manager



Use a ref manager (Bibdesk, Jabref, …)

Put files in cloud (Dropbox/Google Drive), synced across all devices

Whenever you found a good paper, **add it to the ref manager**, **cite it in your paper** with some sentences.

Tables

signal processing concept	algebraic concept (coordinate free)	in coordinates
fi lter	$h \in \mathcal{A}$ (algebra)	$\phi(h) \in \mathbb{C}^{J \times I}$
signal	$s = \sum s_i b_i \in \mathcal{M}$ ($\mathcal{A}$-module)	$\mathbf{s} = (s_i)_{i \in I} \in \mathbb{C}^I$
fi ltering	$h \cdot s$	$\phi(h) \cdot \mathbf{s}$
impulse	base vector $b_i \in \mathcal{M}$	$\mathbf{b}_i = (\dots, 0, 1, 0 \dots)^T \in \mathbb{C}^I$
impulse response of $h \in \mathcal{A}$	$h \cdot b_i \in \mathcal{M}$	$\phi(h) \cdot \mathbf{b}_i = (\dots, h_{-1}, h_0, h_1, \dots)^T \in \mathbb{C}^I$
Fourier transform	$\Delta : \mathcal{M} \to \bigoplus_{\omega \in W} \mathcal{M}_\omega$	$\mathcal{F} : \mathbb{C}^I \to \bigoplus_{\omega \in W} \mathbb{C}^{d_\omega}$ $\Leftrightarrow \phi \to \bigoplus_{\omega \in W} \phi_\omega$
spectrum of signal	$\Delta(s) = (s_\omega)_{\omega \in W} = \omega \mapsto s_\omega$	$\mathcal{F}(\mathbf{s}) = (\mathbf{s}_\omega)_{\omega \in W} = \omega \mapsto \mathbf{s}_\omega$
frequency response of $h \in \mathcal{A}$		$(\phi_\omega(h))_{\omega \in W} = \omega \mapsto \phi_\omega(h)$

Tables should be **clear & focus on the data**

avoid vertical lines

avoid double horizontal lines

avoid boxing up cells and

leave enough space between rows

Table 4: Material parameters and characteristics for all simulations.

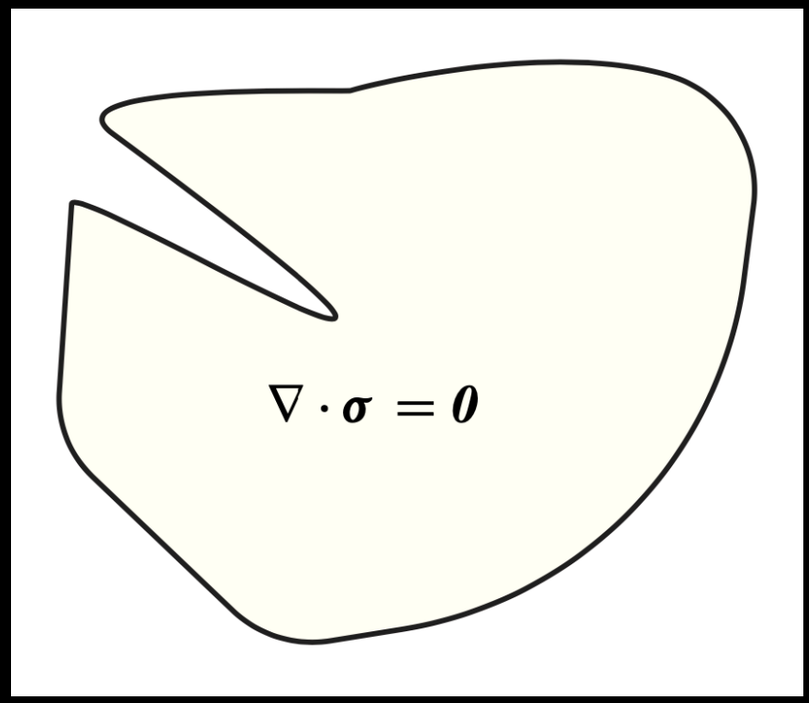
Parameter	Section 5.1	Section 5.2
Young's modulus [MPa]	210×10^3	145
Poisson's ratio [-]	0.3	0.45
Tensile strength [MPa]	2445	20
Experimentally validated	n/a	n/a
Solver	multi-step AM	single-step AM implicit-explicit
State	Plane strain	Plane strain

Figures

The reader usually starts by reading the abstract, conclusion and figures

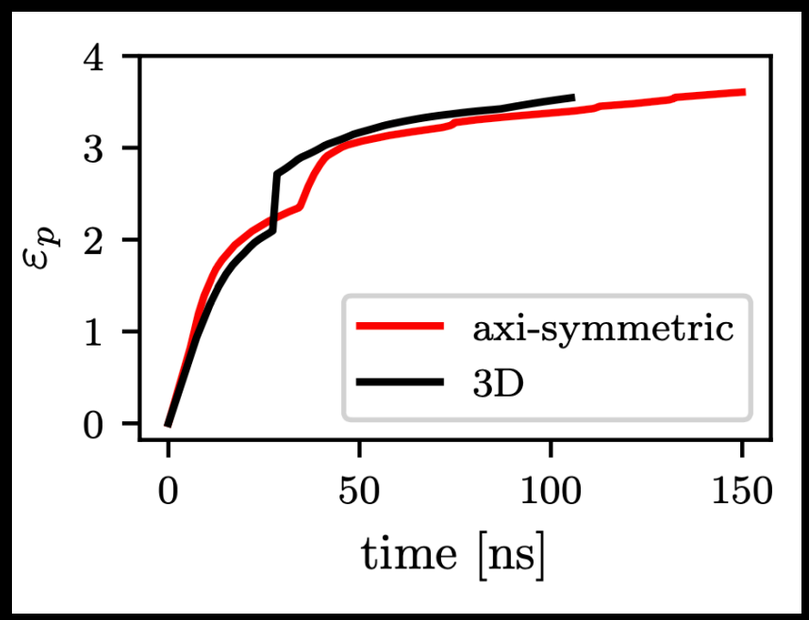
A high quality figure:

- a **legible font size (font matches the font text)**
- a **high resolution (should be PDFs)**
- **color-blindness aware (distinguish** red **and** green**)**
- **all axes are clearly defined**



Sketches

Matlab or **matplotlib** (graphs)
Adobe Illustrator or **Inkscape** (sketches)



Graphs

Figures: how to cite them

Fig. 1: This is a cat.

~~A cat is given in Fig.1. As can be seen, it has two eyes.~~

A cat has two eyes (Fig. 1).

Same thing applies to tables

Global paragraph for long sections

4. Homogeneous solutions

This section presents the analytical homogeneous solution for a bar under uniaxial tension. For simplicity, no body force and acceleration are considered. Furthermore, only monotonic loadings are assumed. This exercise serves multiple purposes: (i) it helps us understand the model, (ii) it demonstrates that some models are sensitive to b, (iii) it is a good test to check the FE implementation.

We plan this section as follows. The homogeneous solutions for the damage and stress field are treated in Section 4.1. Then, comparative studies of Neo-Hookean-I and Neo-Hookean-II and of `AT1/2` and `PF-CZM` are presented in Section 4.2.

4.1. Homogeneous damage and stress field

don’t lose your readers

Don’t start a section with a fig/equation/table

2. Formulations

Fig. 1: This is a cat.

blahblahblahblahblahblahblahblahblahblahblahblah
blahblahblahblahblahblahblahblahblahblahblahblahblah
blahblahblahblahblahblahblahblahblahblahblahblah

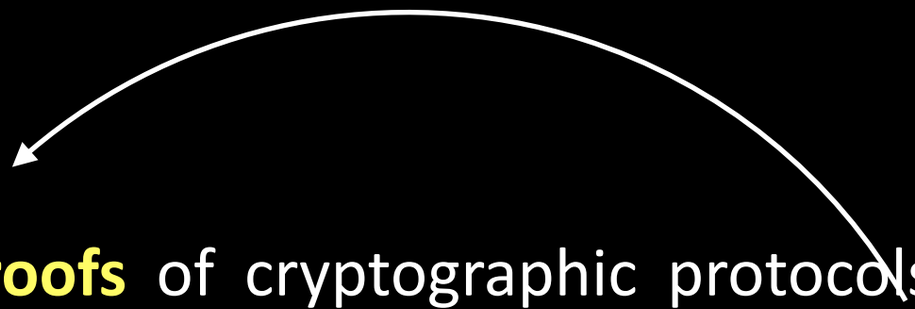
How to write a paragraph: flow

In the phase-field modeling of fracture in brittle and quasi- brittle solids, it is crucial to represent the **asymmetric tensile/compressive material behavior**. **Existing phase-field models generally adopt an intuitive split of the free energy density without capturing the crack boundary conditions properly or an ad hoc hybrid formulation at the loss of variational consistency**. To address ***this issue***, this work presents a variationally consistent phase-field anisotropic damage model.

In the phase-field modeling of fracture in brittle and quasi- brittle solids, it is crucial to represent the **asymmetric tensile/compressive material behavior**: **fracture does not occur in domains under compression**. To capture **this asymmetric behavior,** previous phase-field models generally adopt either an intuitive split of the free energy density without capturing the crack boundary conditions properly ... This work presents a phase-field anisotropic model that is able to capture the ***asymmetric behavior, variationally consistent and satisfy crack boundary conditions***.

sentences start with familiar (old) information and end with unfamiliar (new) information

How to write a paragraph: flow



Security proofs of cryptographic protocols are crucial for the security of everyday electronic communication. However, **these proofs** tend to be complex and difficult to get right. To make it easier to manage **such proofs**, Jones et al. have proposed a new design principle, called the **game-playing technique**. **This technique** follows a code-based approach where the security properties are formulated in therms of probabilistic programs, called games.

How to write a paragraph: original version

The material point method (MPM) is a particle-grid method suitable for solving large deformations of complicated geometries. A traditional MPM implementation treats each particle as a lumped mass. The generalized interpolation material point (GIMP) method is a generalization of the MPM that accounts for finite spatial extent occupied by each particle. MPM and GIMP have been successfully used in simulation of a range of complicated engineering problems… In MPM, the material domain is represented by a set of material points or particles and uses a mixed Eulerian–Lagrangian method in which Lagrangian particles carry history-dependent state data and an Eulerian background grid is used for calculation of derivatives and solving the momentum equation. In summary, the MPM has the advantages of both Eulerian and Lagrangian formulations. Another interesting feature of traditional MPM is that this method enforces no-slip contact between bodies automatically without any further computational costs. However, the MPM suffers from a 'cell crossing instability' for problems involving large displacements. This instability occurs whenever particles cross boundaries of any cell in the computational background grid and is due to the lack of smoothness of the grid basis functions used as the interpolation and mapping functions in the MPM. By introducing weighting functions and gradient …, the GIMP is capable of reducing these errors and improving accuracy [3]. These functions, which can be interpreted as averages of the basis function and its gradient over the particle domain, are used for mapping and interpolating data between particles and grid nodes as well as calculating internal and external forces.

How to write a paragraph: analyse

The material point method (MPM) is a particle-grid method suitable for solving large deformations of complicated geometries. **A traditional MPM implementation treats each particle as a lumped mass**. **The generalized interpolation material point (GIMP) method is a generalization of the MPM that accounts for finite spatial extent occupied by each particle.** MPM and GIMP have been successfully used in simulation of a range of complicated engineering problems… *In MPM, the material domain is represented by a set of material points or particles and uses a mixed Eulerian–Lagrangian method in which Lagrangian particles carry history-dependent state data and an Eulerian background grid is used for calculation of derivatives and solving the momentum equation. In summary, the MPM has the advantages of both Eulerian and Lagrangian formulations. Another interesting feature of traditional MPM is that this method enforces no-slip contact between bodies automatically without any further computational costs. However, the MPM suffers from a 'cell crossing instability' for problems involving large displacements. This instability occurs whenever particles cross boundaries of any cell in the computational background grid and is due to the lack of smoothness of the grid basis functions used as the interpolation and mapping functions in the MPM*. By introducing weighting functions and gradient …, the GIMP is capable of reducing these errors and improving accuracy [3]. These functions, which can be interpreted as averages of the basis function and its gradient over the particle domain, are used for mapping and interpolating data between particles and grid nodes as well as calculating internal and external forces.

How to write a paragraph: better version?

The material point method (MPM) is a particle-grid method suitable for solving large deformations of complicated geometries. *In MPM, the material domain is represented by a set of material points or particles, which are treated as lumped masses, and uses a mixed … However, the MPM suffers from a 'cell crossing instability' for problems involving large displacements. This instability occurs … the lack of smoothness of the grid basis functions used as the interpolation and mapping functions in the MPM*.

By introducing weighting functions and gradient …, the GIMP is capable of reducing these errors and improving accuracy [3]. These functions, which can be interpreted as averages of the basis function and its gradient over the particle domain, are used for mapping and interpolating data between particles and grid nodes as well as calculating internal and external forces. **The generalized interpolation material point (GIMP) method is a generalization of the MPM that accounts for finite spatial extent occupied by each particle.** MPM and GIMP have been successfully used in simulation of a range of complicated engineering problems…

Any thing wrong?

In this paper, we present the following contributions:

- A unified fourth order phase field fracture framework for brittle and quasi-brittle solids ;
- A semi-analytical (analytical-numerical) approach for PF-CZM;
- A almost length scale insensitive fourth order PFM;
- The first fourth order PFM for cohesive fracture;
- The PF-CZM is applied to study the phenomena of crack kinking in anisotropic brittle fracture

Any thing wrong?

In this paper, we present the following contributions:

- A unified fourth order phase field fracture framework for brittle and quasi-brittle fracture;
- A semi-analytical approach for the fourth order PF-CZM;
- A comparison of the fourth order PF-CZM against the second order PF-CZM;
- A study of the phenomena of crack kinking and sawtooth cracking in strongly anisotropic brittle fracture.

Parallel structure

Parallel structures: Martin Luther King's "I Have a Dream"

I have a dream that one day this nation will rise up and live out the true meaning of its creed: "We hold these truths to be self-evident, that all men are created equal."
I have a dream that one day on the red hills of Georgia, the sons of former slaves and the sons of former slave owners will be able to sit down together at the table of brotherhood.
I have a dream that one day even the state of Mississippi, a state sweltering with the heat of injustice, sweltering with the heat of oppression, will be transformed into an oasis of freedom and justice.
I have a dream that my four little children will one day live in a nation where they will not be judged by the color of their skin but by the content of their character.
I have a dream today! . . .

Parallel structures

Pairs of ideas—two ideas joined by "and" "or" or "but"—should be written in parallel form.

We hoped **to increase the response** and **to improve survival.**

If you want to be a good doctor, you must **study hard**, **critically think about the medical literature**, and **you should be a good listener**.

If you want to be a good doctor you must **study hard,** **listen well**, and **think critically** about the medical literature. (imperative, imperative, imperative)

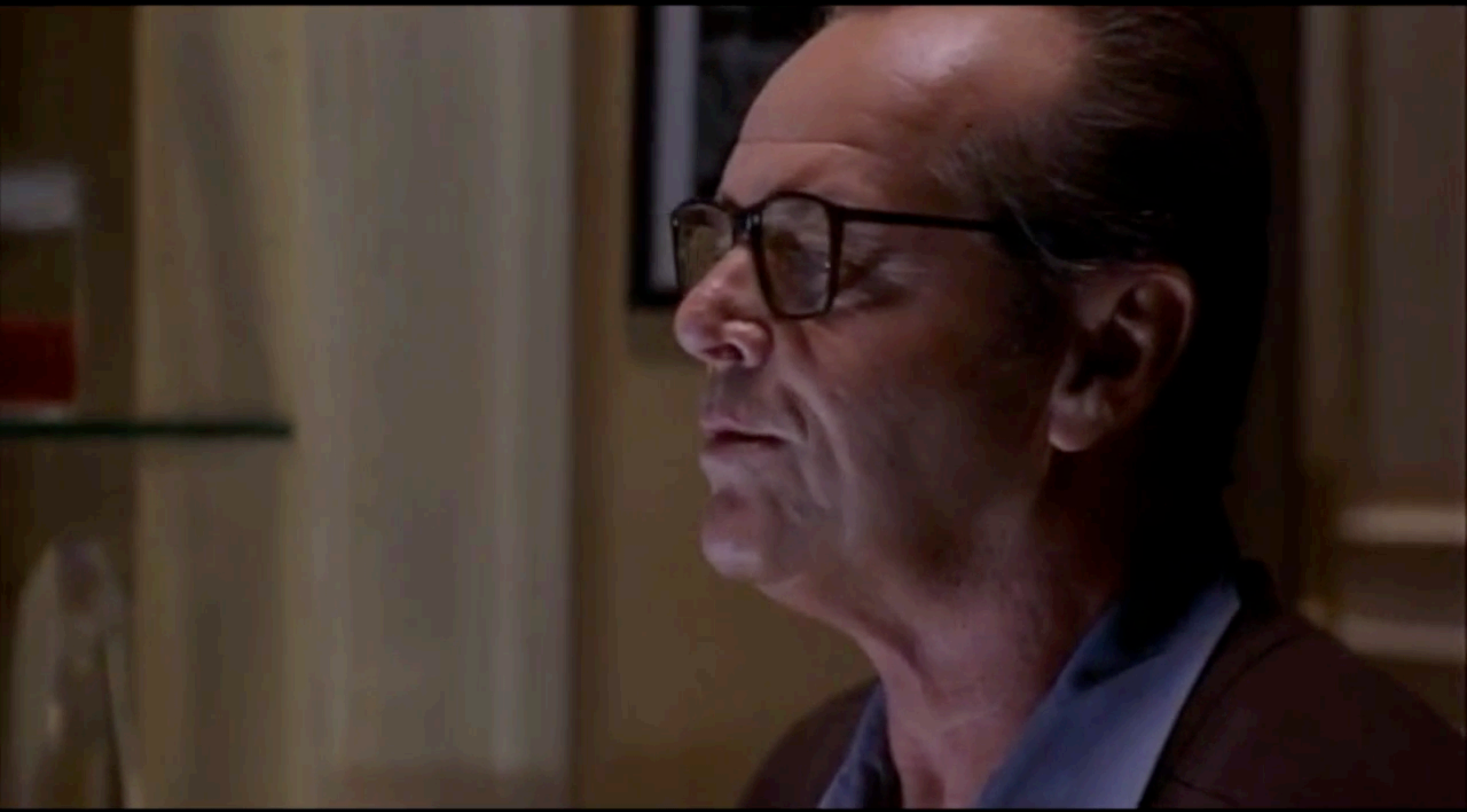
If you want to be a good doctor, you must be a good student, a good listener, and a critical thinker about the medical literature. (noun, noun, noun)

Dont’s and dos

Don’t/Avoid	Do/Use
The Table/Figure 2	Table/Figure 2
The Equation (2.2)	Equation (2.2)
The Young’s modulus	Young’s modulus, or the Young modulus
Start a section with a table/figure/equation	Start a section with text
This topic has interested researchers for a **long** time	... for more than 20 years
A **bad** result	A poor/negative result
This section **serves** to explain	This section explains
It is **obvious/clear** ...	
Due to the fact that ...	Because ...
It should be noted that there are 5 samples in this study	This study consisted of 5 ...
In order to include ...	To include ...
The difference was **found to be** significant	The difference was significant
We plotted the data **by** using ...	We plotted the data using ...
Utilize or usage	Use
We **think/believe/feel** that the results are good	The results are good
Existing works ...	Previous work
Using adjectives such as ‘very’, ‘always’, ‘never’	
Using words like ‘ground-breaking’, ‘paradigm shift’	
Using ’Above-mentioned’ or ’aforementioned’	
	Always spell out an acronym the first time it is used
Use long titles	Use short titles (Paiva et al., 2012)
	Use a spell checker to get rid of all spell errors

Dont's and dos

end results → **results**
completely eliminate → **eliminate**
completely filled → **filled**
equal halves → **halves**
as mentioned above: remove it or be more specific, as mentioned in Sec. 2.
very small → **tiny** (avoid very which is not precise)
always, never: avoid them



When to use and not to use ‘the’

The tensile membrane structures are widely used for lightweight and long-span roofs. These structures are defined as a combination of tensioned *fabric membrane* and supporting elements such as rigid structural frame or flexible cables (Gale and Lewis, 2016). **The** *fabric membrane* uses the pre-stress of tension and its shape to resist **the** external loading, while **the** supporting elements are compressed and bent by the tension in membrane. The design process of these structures involves three steps as *form finding*, load analysis and cutting pattern generation. The first step is to find the shape of structures in which the prescribed pre-stress are in equilibrium with a given boundary condition, while the second step investigates the behavior of [**the**] fabric membrane and supporting elements under service loads. The shapes obtained by [**the**] *form finding process* are usually in doubly curved surface, so they cannot be flattened into plane without distorting. In addition, the fabric membrane itself is manufactured in plane panels of 1-5m widths (Ishii, 1999). As a result, a specialist design process, third step of cutting pattern, have to be conducted.

read out loud

Passive or active voice?

A common belief: passive voice makes writing more **formal & objective**

a personal tone can help to **engage a reader**

And the sentences are shorter and thus easier to understand

Use both

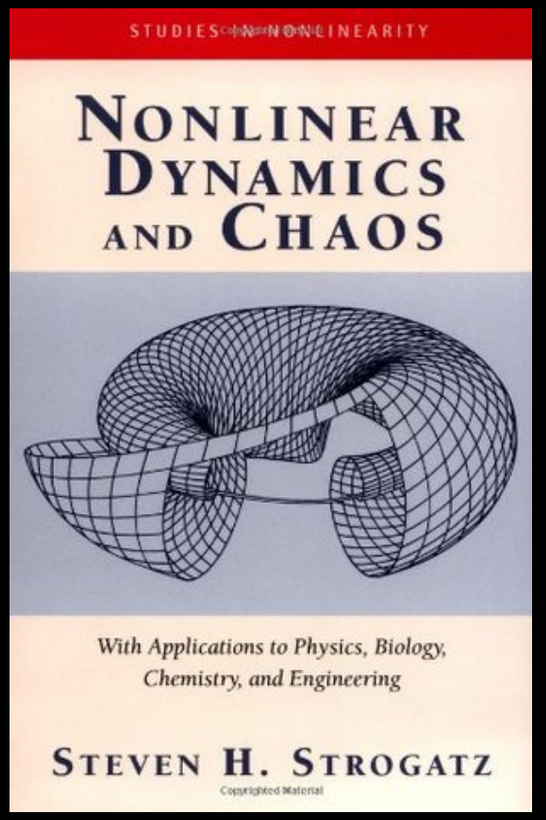
https://www.youtube.com/watch?v=1pzjxYCwb08

Active voice in the literature review

Although dynamics is an interdisciplinary subject today, it was originally a branch of physics. The subject began in the mid-1600s, when **Newton invented differential** equations, discovered his laws of motion and universal gravitation, and combined them to explain Kepler's laws of planetary motion. …

The breakthrough came with the work of Poincare in the late 1800s. **He introduced** a new point of view that emphasized qualitative rather than quantitative questions.

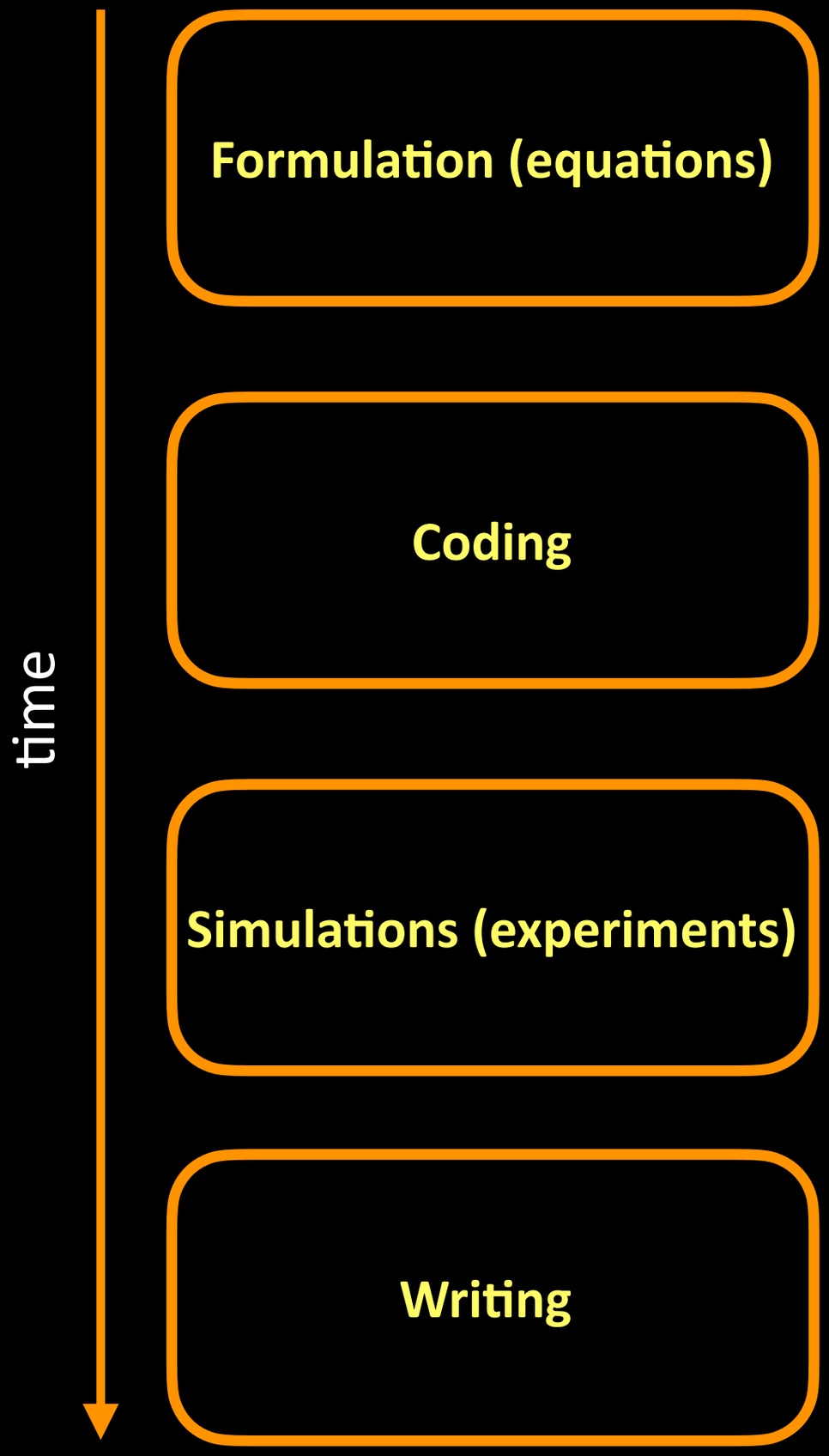
The invention of the high-speed computer in the 1950s was a watershed in the history of dynamics. … Such experiments led to Lorenz's discovery in 1963 of chaotic motion on a strange attractor. **He studied a simplified model** of convection rolls… **Lorenz found that the solutions** to his equations never settled down …



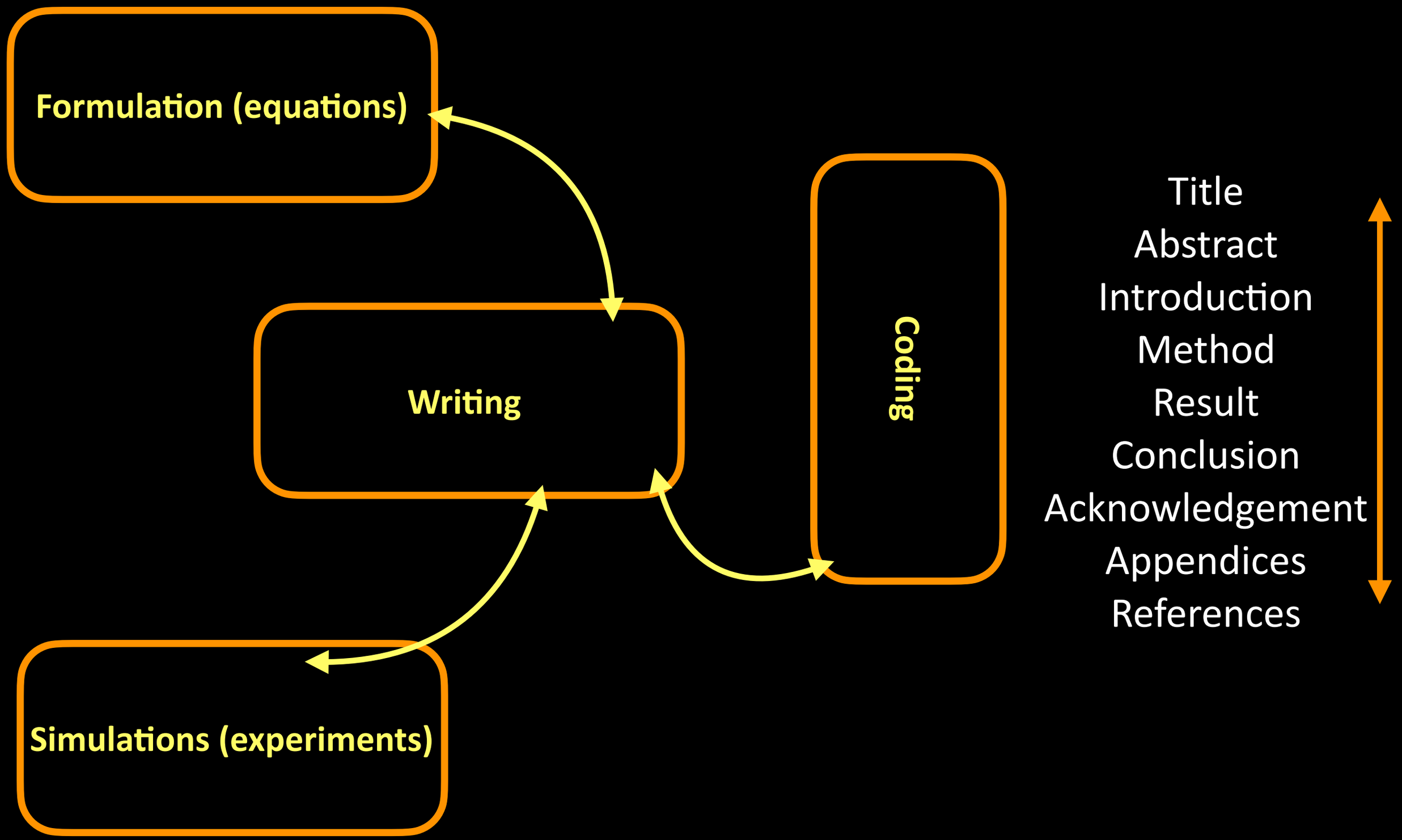
A table of main symbols might be useful

Variable	Type	Meaning
$\mathbf{x}_J$	Vector	Nodal position of the FE mesh (time-dependent)
$\mathbf{X}_J$	Vector	Initial nodal position of the FE mesh
$\mathbf{v}_J$	Vector	Nodal velocity of the FE mesh
m_J	Scalar	Nodal mass of the FE mesh
$\boldsymbol{\sigma}_g$	Tensor/Matrix	Particle Cauchy stress
$\mathbf{P}_g$	Tensor/Matrix	Particle 1st Piola-Kirchoff stress
$\mathbf{F}_g$	Tensor/Matrix	Particle deformation gradient
$\mathbf{L}_g$	Tensor/Matrix	Particle velocity gradient
$\mathbf{D}_g$ or $\dot{\boldsymbol{\epsilon}}_p$	Tensor/Matrix	Particle rate of deformation
$\mathbf{v}_I$	Vector	Node velocity of the Eulerian grid
$\mathbf{v}_I^{t+\Delta t}$	Vector	Final updated node velocity
m_I	Scalar	Node mass of the Eulerian grid
$\phi_I(\mathbf{x}_J)$	Scalar	Grid basis function of node I evaluated at point J
$\phi_I^{\mathrm{FE}}(\boldsymbol{\xi}_g)$	Scalar	FE basis function of node J evaluated at quadrature point g
$\nabla\phi_J^{\mathrm{FE}}(\boldsymbol{\xi}_g)$	Vector	Gradient (w.r.t $\mathbf{x}$) of FE function of node J evaluated at g
$\nabla_0\phi_J^{\mathrm{FE}}(\boldsymbol{\xi}_g)$	Vector	Gradient (w.r.t $\mathbf{X}$) of FE function of node J evaluated at g

Writing flow: inefficient way



Writing flow: efficient way



Writing flow: efficient way

Write from the beginning

When **stuck, move to other parts, or do something else**

First draft when the last experiment/simulation is done

Don’t worry about the length: **a report/paper/book chapter**

Submission

only send it to your supervisors when **typos were carefully checked**
do not submit your paper until you're happy about it
ask peers to read over your work: e.g. another PhD student
effective to **get feedback sequentially** rather than in parallel

When should you submit your paper? The answer is when you think it is ready
Don't be too picky as Voltaire once said, "**The best is the enemy of the good**"

Use of LaTeX in scientific publications

Disciplines	LaTeX rate
Mathematics	96.9%
Statistic and Probability	89.1%
Physics	74.0%
Computer Sciences	45.8%
Engineering	1.0%

https://www. the- scientist.com/uncategorized/dont- format- manuscripts- 44040.

$$\int_{\Omega} \boldsymbol{\sigma}(\boldsymbol{u}, d) : \nabla \delta \boldsymbol{u} \mathrm{d}V + \int_{\Omega} \rho \ddot{\boldsymbol{u}} \cdot \delta \boldsymbol{u} \mathrm{d}V = \int_{\partial \Omega_t} \boldsymbol{t}^* \cdot \delta \boldsymbol{u} \mathrm{d}A + \int_{\Omega} \boldsymbol{b}^* \cdot \delta \boldsymbol{u} \mathrm{d}V \tag{2.5a}$$

$$\int_{\Omega} \left[-\mathcal{Y} \delta d + \frac{G_{\mathrm{f}}}{c_{\alpha}} \left(\frac{\alpha'(d)}{b} \delta d + 2b \nabla d \cdot \nabla \delta d \right) \right] \mathrm{d}V \geq 0 \tag{2.5b}$$

Use of LaTeX in scientific publications

momentum in time
is equal to the sum of all external forces (volume and surface
forces) acting on the body. It is described by the so-called \emph{the momentum equation}:

```
\begin{equation}\label{chap2-linear-momentum-eq}
    \rho\frac{D\vm{v}}{Dt}  = \nabla \cdot \bsym{\sigma} + \rho \vm{b}
    \quad \textrm{or} \quad \rho \dot{v}_i = \sigma_{ji,j} + \rho b_i
\end{equation}
```

$$\rho \frac{Dv}{Dt} = \nabla \cdot \sigma + \rho b \quad \text{or} \quad \rho \dot{v}_i = \sigma_{ji,j} + \rho b_i$$

it is **open source (free)**
created by scientists for scientists
do not **worry about format**
high quality pdf
beautiful equations
automate the writing

```
\usepackage[sty
\addbibresource{
\begin{document}
\title{The IF cc
\author{Daniel A
\maketitle
\section{A past
In a certain sen
was defined by a
transcend: as on
astonishing, goi
the first time'.
communities ---
fans that are fc
\parencite[see][
geographically-c
that have entere
\parencite*{lena
Traditionalist m
scenes such as I
```

If you're a MS Word guy, why LaTeX?

why not?

In LaTeX, you are **not programming**, but simply a **markup language**

if you know another tool, you can use Word better

people using **non-default browser** (Firefox/Chrome), ended up staying at their jobs about 15% longer than ones with **Safari/Internet** Explorer. They performed better on the job

increases career opportunities

what if your supervisor is a Word guy??? …

https://www.theatlantic.com/business/archive/2015/03/people-who-use-firefox-or-chrome-are-better-employees/387781/

Take home message

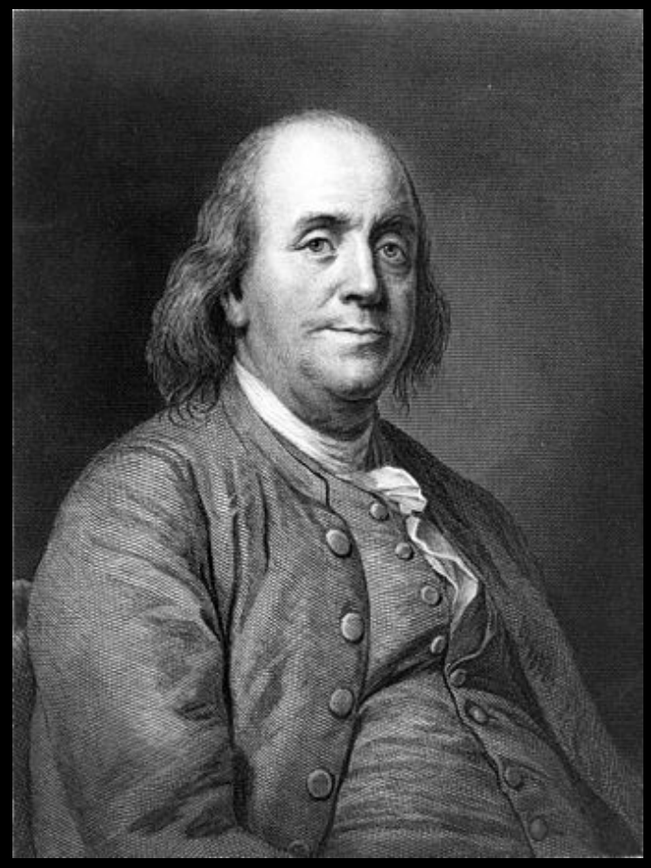
identify the selling point of your paper
explicitly state your contributions
use simple, direct language
Clarity > grammatical exactness
high-resolution graphics with legible font size
don’t lose your reader:
- **— ideas first, data/result second**
- **— plan their reading**
- **— explain everything**
- **— provide all data required to reproduce your results**

write early

Writing well is a skill can be learned

mimic the writing of your favourite researcher
read a lots: not only content but also **the writing**
read papers from a **different field**
re-write your published papers until you're satisfied
write a lots (besides papers: blog, reports, …)

feel free to deviate from all these writing styles!



Write a lots

The Material Point Method:
theory, implementations and applications

~ 500 pages

Phase field modelling of fractures

Vinh Phu Nguyen
Department of Civil Engineering
Monash University

November 22, 2017

~ 100 pages

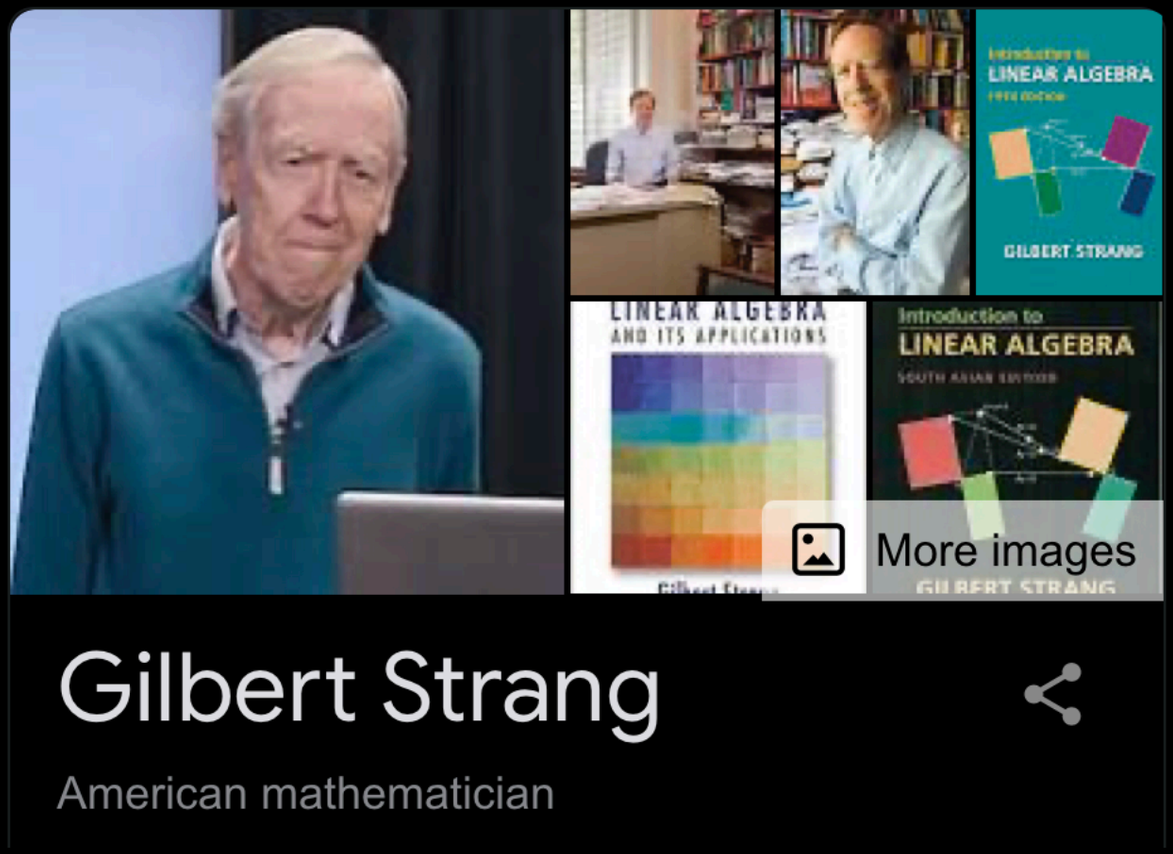
Isogeometric Analysis

Vinh Phu Nguyen
Delft unitversity of Technology
Falculty of Civil Engineering and Geosciences
Computational Mechanics Group

~ 110 pages

...

But writing is time consuming 😪



Strang 'I get up early'
write one page a day

365 days → 365 pages!

One more thing

How to effortlessly write a high quality scientific paper in the field of computational engineering and sciences

Preprint | File available | March 2020

Vinh Phu Nguyen · Stéphane Pierre Alain Bordas · Alban de Vaucorbeil

Source

Add to project | Add published version

How to write a high-quality paper

Presentation | File available | July 2020

Vinh Phu Nguyen

Source

https://www.youtube.com/watch?v=WP-FkUaOcOM
https://www.youtube.com/watch?v=jLPCdDp_LE0&t=912s
https://www.youtube.com/watch?v=1pzjxYCwb08

The end

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