

# *Academic Writings and Presentations*

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# Construct a Paper

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# Who will read your paper?

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- Many will read the title
- Some will read the abstract
- Fewer will look at the graphs
- Very few will read the entire article

*Many papers are only read by ~5 persons:*

*Yourself + your advisor + 3 reviewers*

# Preliminaries

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- **Preparation**
  - data and reference collection should start on the first day of your research
  
- **Who are the readers?**
  - students, engineers, scientists?
  - ***reminder:*** first readers are always journal editors and reviewers

# Prepare the data

Figure 1

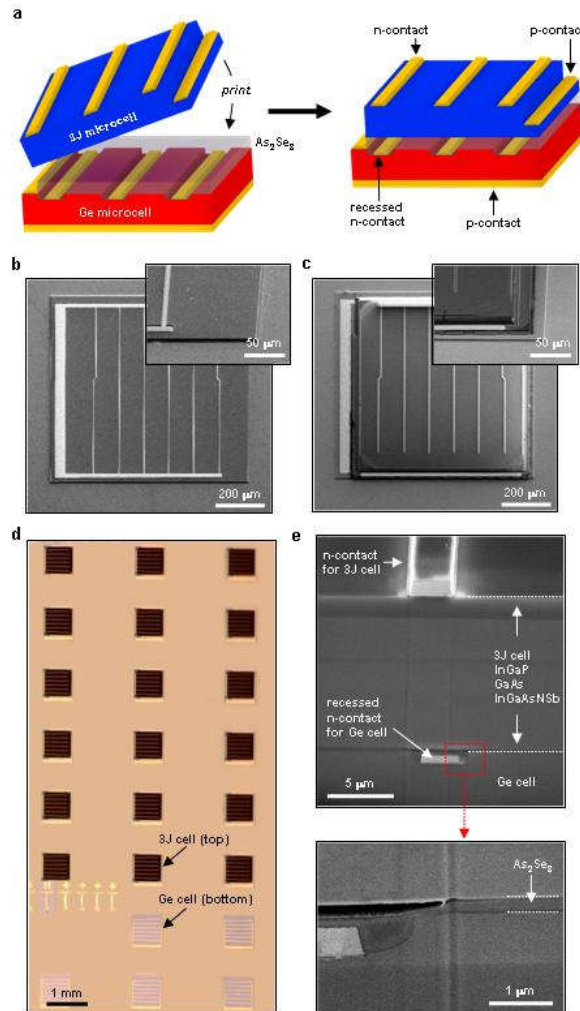
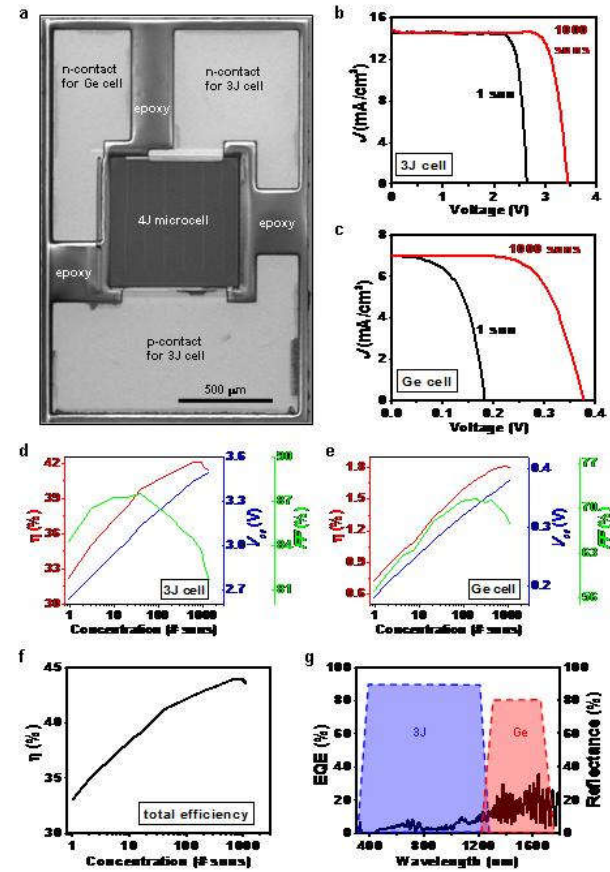


Figure 2



# Prepare the data

Figure 3

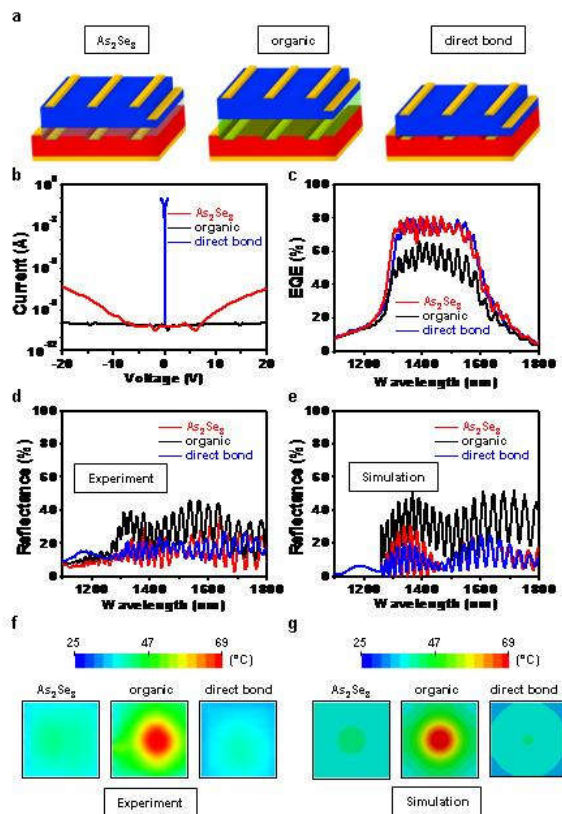
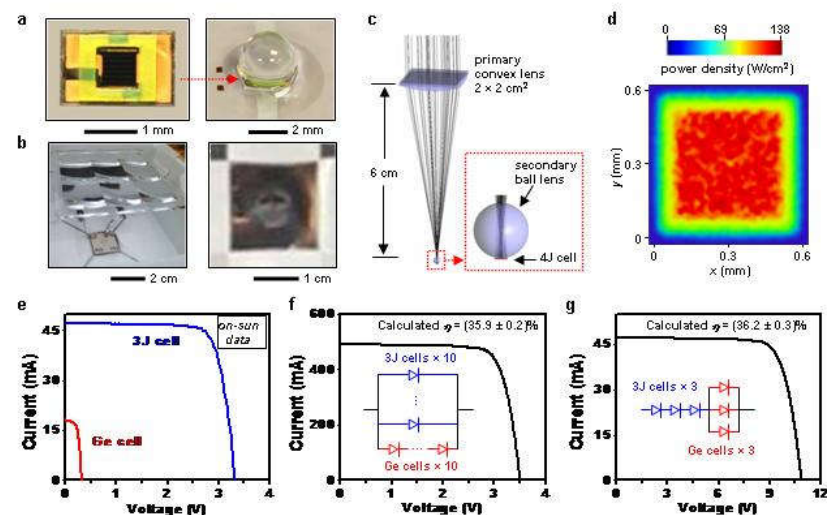


Figure 4



# Add supplements if necessary

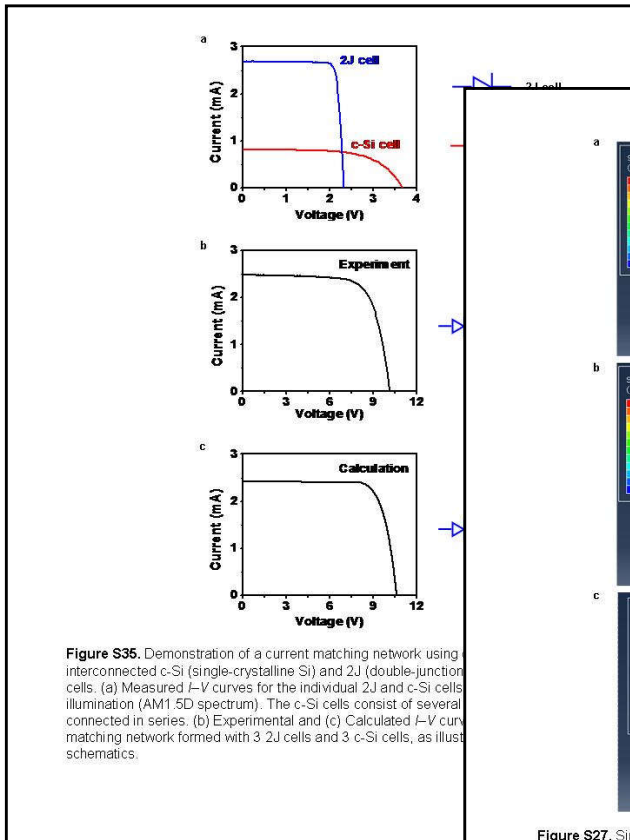


Figure S35. Demonstration of a current matching network using interconnected c-Si (single-crystalline Si) and 2J (double-junction) cells. (a) Measured  $I$ - $V$  curves for the individual 2J and c-Si cells under illumination (AM1.5D spectrum). The c-Si cells consist of several cells connected in series. (b) Experimental and (c) Calculated  $I$ - $V$  curves for the current matching network formed with 3 2J cells and 3 c-Si cells, as illustrated in the schematics.

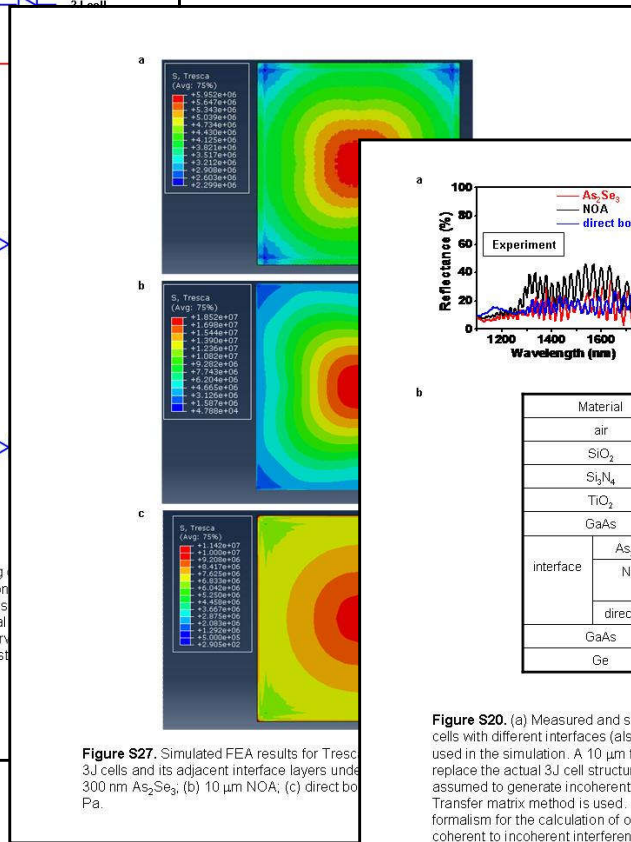


Figure S27. Simulated FEA results for Tresca 3J cells and its adjacent interface layers under 300 nm  $As_2Se_3$ : (a) 10  $\mu m$  NOA; (b) direct bond; (c) direct bond.

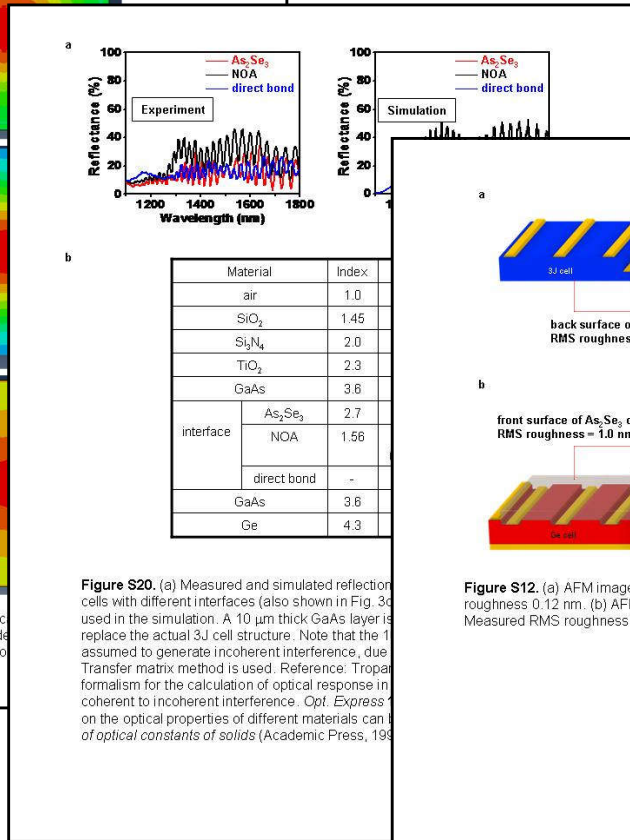


Figure S20. (a) Measured and simulated reflection spectra for different interfaces (also shown in Fig. 30) used in the simulation. A 10  $\mu m$  thick GaAs layer is used to replace the actual 3J cell structure. Note that the 1  $\mu m$  thick GaAs layer is assumed to generate incoherent interference, due to the transfer matrix method is used. Reference: Tropf, *Formalism for the calculation of optical response in coherent to incoherent interference*. *Opt. Express* 19, 10000-10010 (2011). The optical properties of different materials can be found in the book *Optical constants of solids* (Academic Press, 1991).

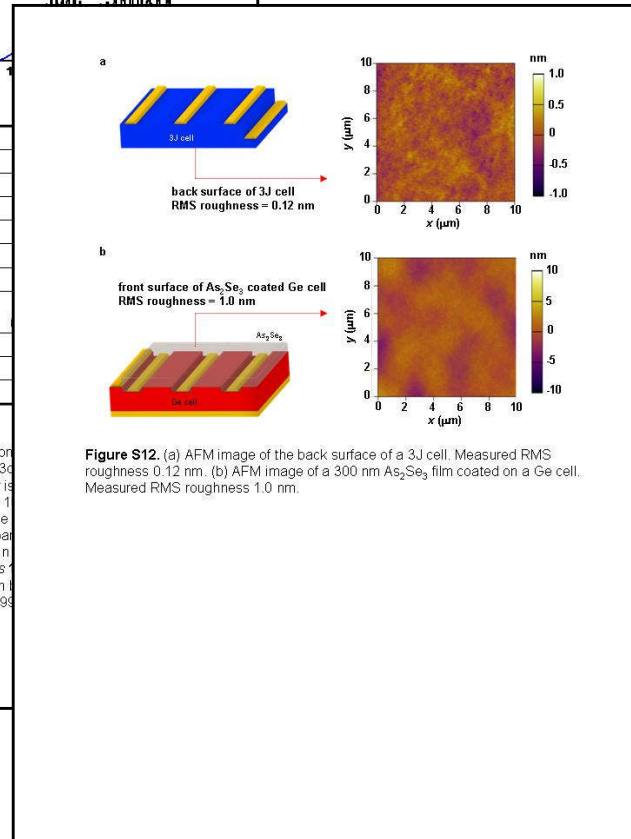
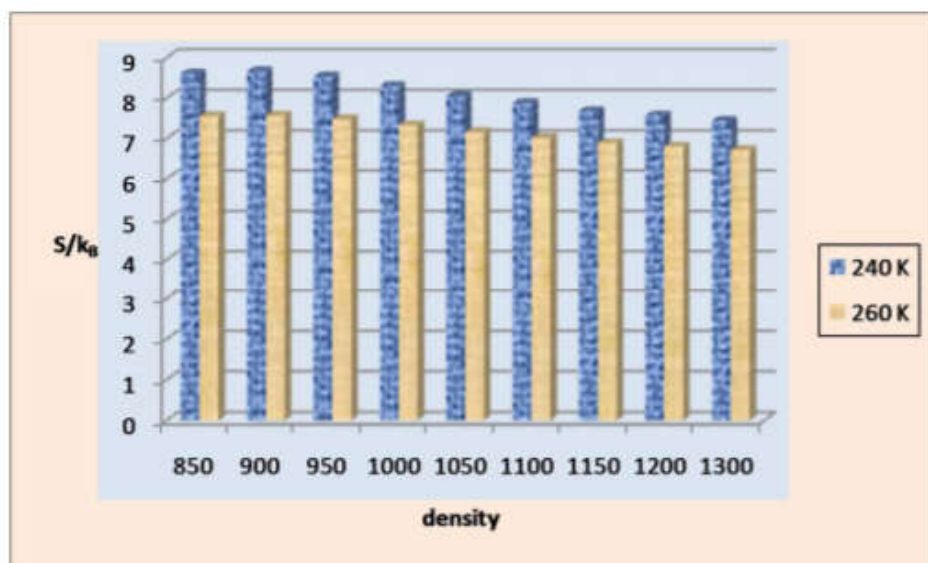


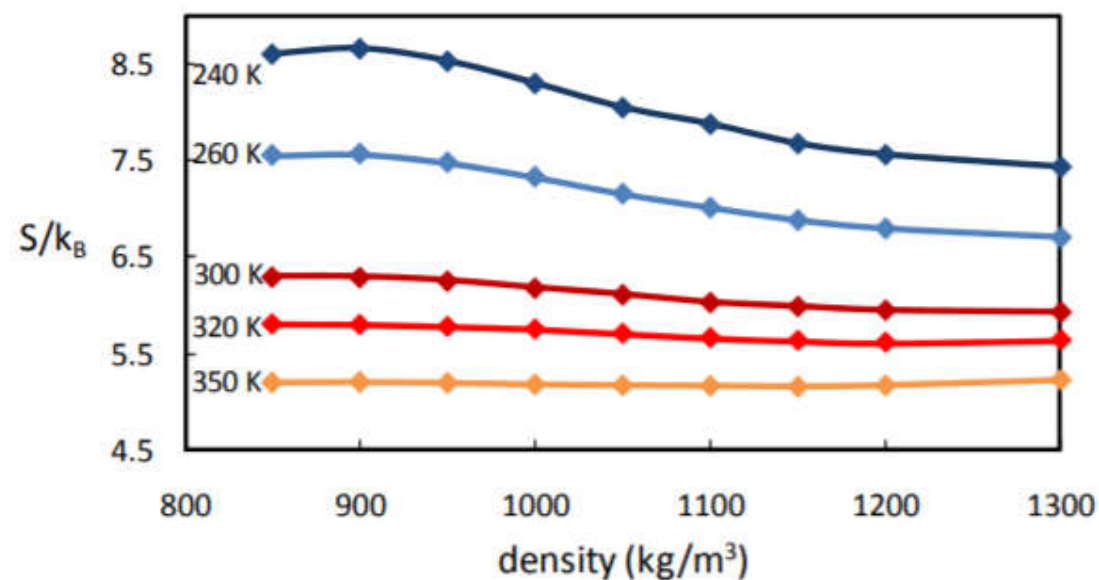
Figure S12. (a) AFM image of the back surface of a 3J cell. Measured RMS roughness 0.12 nm. (b) AFM image of a 300 nm  $As_2Se_3$  film coated on a Ge cell. Measured RMS roughness 1.0 nm.

# Prepare your figures

- Be clear and informative



**Bad**



**Good**

# Collect references


















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- **Read and save related references**
  
- **Useful tools**
  - **Endnote**
  - **Mendeley**
  - ...



# Writing your paper

- **Get your first draft done soon**
  - **finish it, do not make it perfect**
- **Edit your draft**
  - **read it as a critical reviewer**
  - **revise > 5 times**
- **Ask for inputs**
  - **your advisors**
  - **your collaborators**

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# Structures of a Paper

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- **AIMRaD**
  - **Abstract, Introduction, Methods, Results and Discussion**
  
- **AIRDaM**
  - **Abstract, Introduction, Results, Discussion and Methods**

# Structures of a Paper

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- **Title**
- **Authors & Affiliations**
- **Abstract & Key words**
- **Introduction**
- **Results & Discussions**
- **Conclusion**
- **References**
- **Acknowledgement**
- **Supporting Information**

# How you actually write ...

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- **Suggested procedure**
  - **prepare the data set (figures, tables, ...)**
  - **prepare a reference list**
  - **the main text, methods, supplements**
  - **abstract, conclusion, title**
  - **reference, format, acknowledgements, authors, etc**

# Main Text

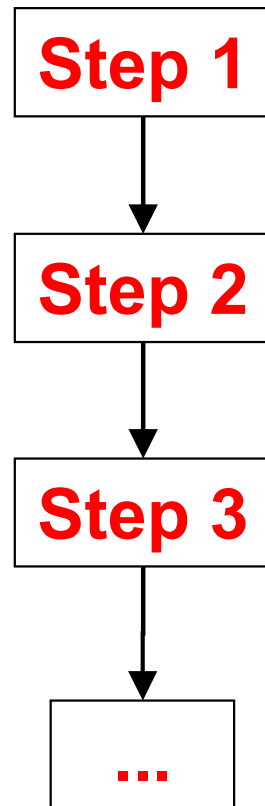
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- Problem X is important
- Previous works A, B and C
- A, B and C have weaknesses
- Our work **D**
- Details of experiments and calculations
- Comparison with A, B and C
- Why **D** is better
- Discussions of strength and weakness of **D**
- Future work

# Structures of a Paper

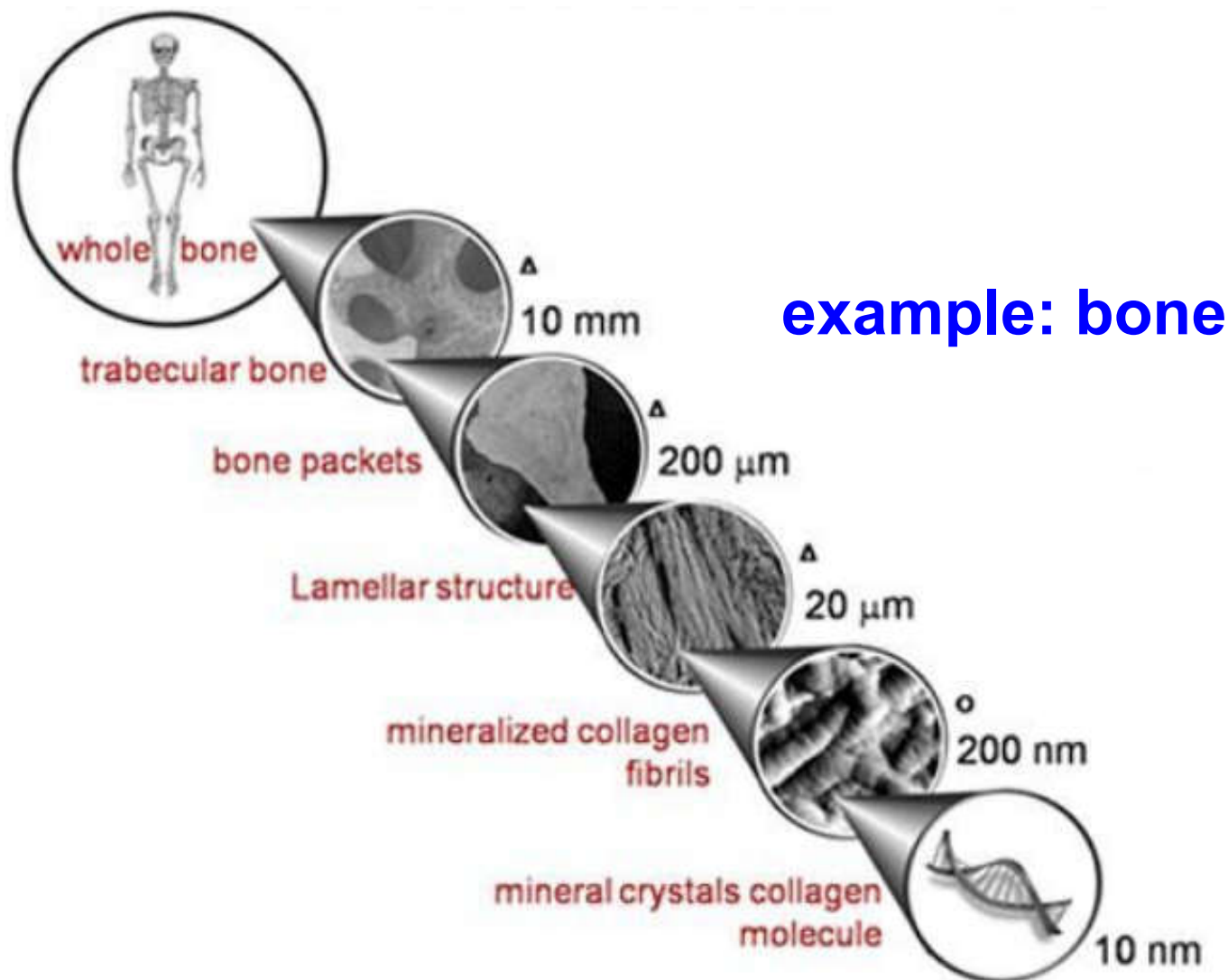
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- **Avoid serial structures**



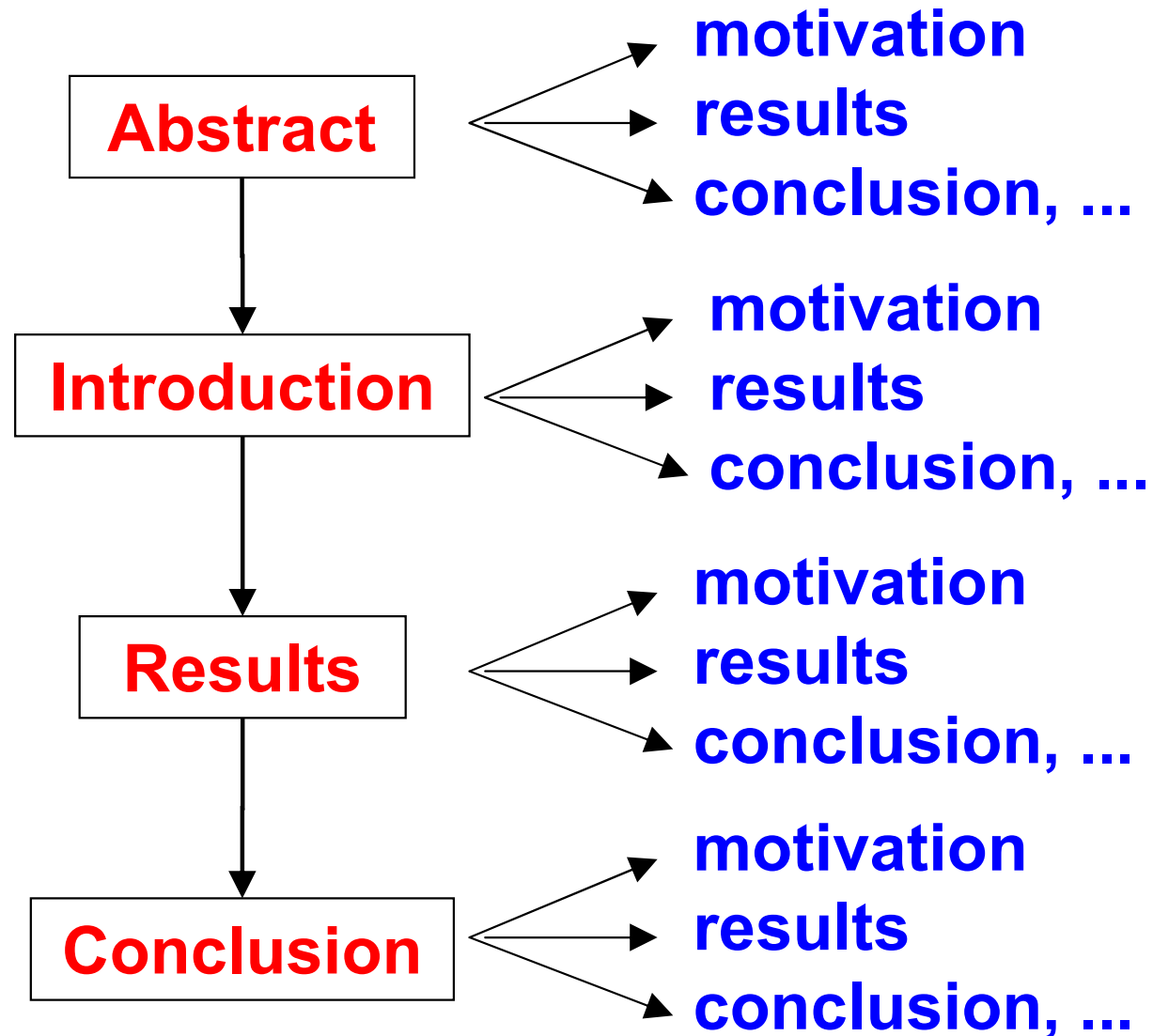
# Structures of a Paper

- Use hierarchical structures



# Structures of a Paper

- Use hierarchical structures





# Structures of a Paper

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Readable in multiple ways

Every part / paragraph / sentence should be

*self-explanatory*

- **Big picture**
  - **title, abstract**
- **Main results**
  - **introductions, headings, figures, conclusion**
- **Methodology**
  - **experiments and methods**
- **Full read**
  - **entire paper**

# Title

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- **Highlight the key point of the paper**

- **High efficiency green lasers**
- **Effective methods to make lasers**
- **Multicolor, tunable lasers**
- **Laser applications for biomedicine**
- ...



- **ABC rule**

- **Accurate**
- **Brief**
- **Clear**

<https://www.natureindex.com/news-blog/how-research-paper-titles-can-make-or-break>

# Abstract

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- **Abstract is the most important part in your paper**
- **It contains the key points of your paper**
  - **Why do you do it?**
  - **What do you do?**
  - **How do you do it?**
  - **What is the impact? (So what?)**
- **Finish it last**

# Abstract 1

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**Advanced optical fibers and photonic structures play important roles in neuroscience research, along with recent progresses of genetically encoded optical actuators and indicators. However, most techniques for optical neural implants rely on fused silica or long-lasting polymeric fiber structures. In this paper, we present implantable and biodegradable optical fibers based on poly(L-lactic acid) (PLLA). PLLA fibers with dimensions similar to standard silica fibers are constructed using a simple thermal drawing process at around 200 C. Formed PLLA fibers exhibit high mechanical flexibility and optical transparency, and their structural evolution and optical property changes are systematically studied during *in vitro* degradation. In addition, their biocompatibility with brain tissues are evaluated in living mice, and fully *in vivo* degradation is demonstrated. Finally, we implement PLLA fibers as a tool for intracranial light delivery and detection, realizing deep brain fluorescence sensing and optogenetic interrogation *in vivo*. The presented materials and device platform offers paths to fully biocompatible and bioresorbable photonic systems for biomedical uses.**

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# Abstract 1

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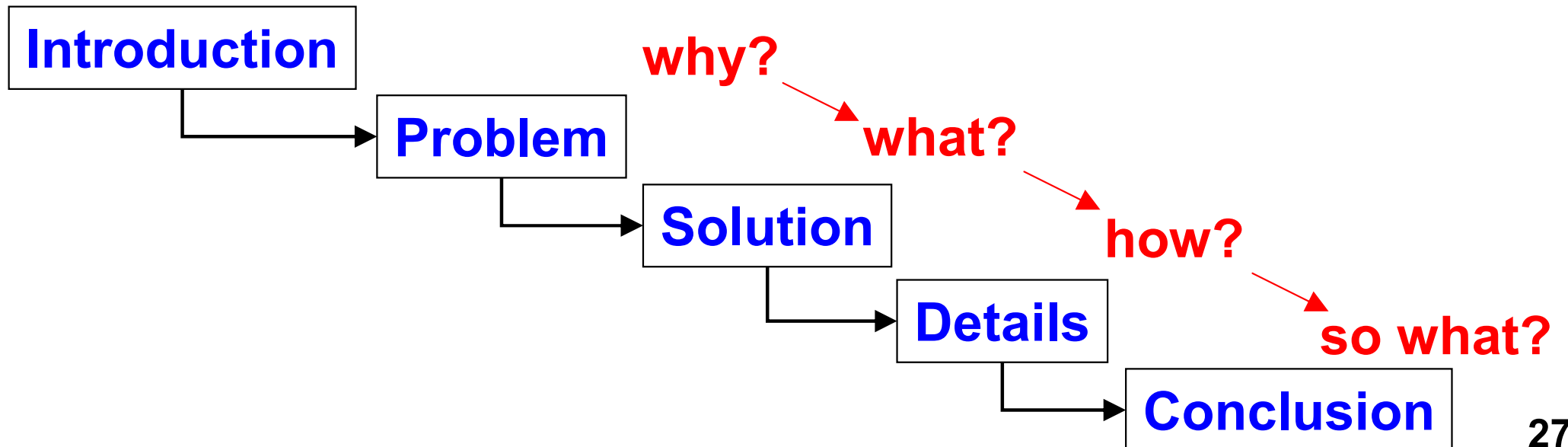
**XXX play important roles in XXX.**

**However, ....**

**In this paper, we present ...**

**... In addition, ... Finally, ...**

**The presented XXX offers paths to XXX systems for XXX.**



# Abstract 2

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**Two-dimensional (2D) materials are of tremendous interest to integrated photonics, given their singular optical characteristics spanning light emission, modulation, saturable absorption and nonlinear optics. To harness their optical properties, these atomically thin materials are usually attached onto prefabricated devices via a transfer process. Here, we present a new route for 2D material integration with planar photonics. Central to this approach is the use of chalcogenide glass, a multifunctional material that can be directly deposited and patterned on a wide variety of 2D materials and can simultaneously function as the light-guiding medium, a gate dielectric and a passivation layer for 2D materials. Besides achieving improved fabrication yield and throughput compared with the traditional transfer process, our technique also enables unconventional multilayer device geometries optimally designed for enhancing light-matter interactions in the 2D layers. Capitalizing on this facile integration method, we demonstrate a series of high-performance glass-on-graphene devices including ultra-broadband on-chip polarizers, energy-efficient thermo-optic switches, as well as graphene-based mid-infrared waveguide-integrated photodetectors and modulators.**

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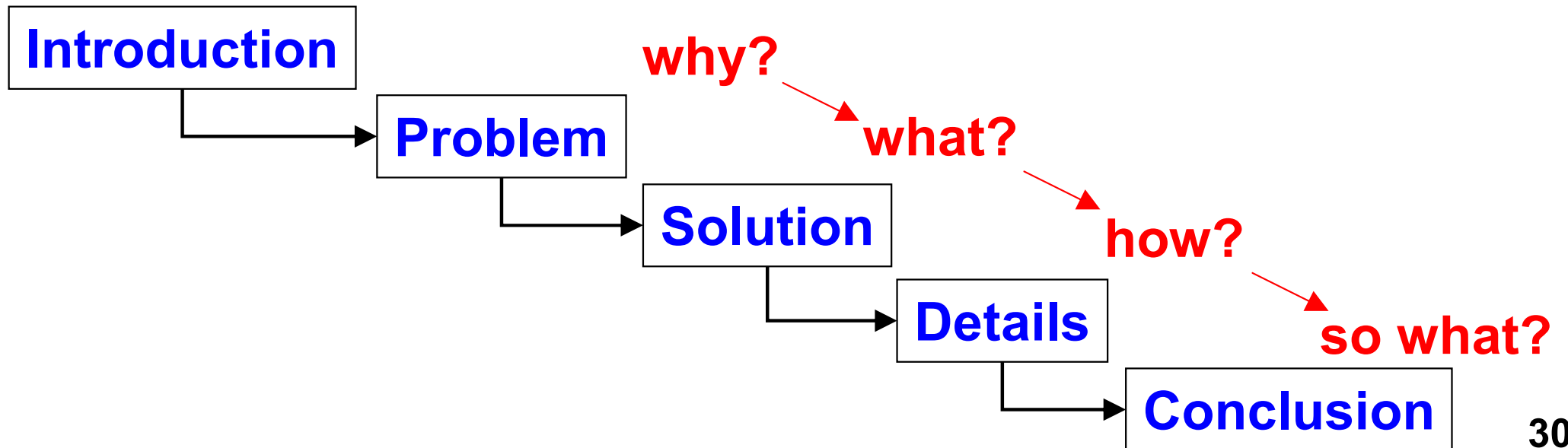
... are of tremendous interest to ...

To harness ..., ... are usually ...

Here, we present a new route for ...

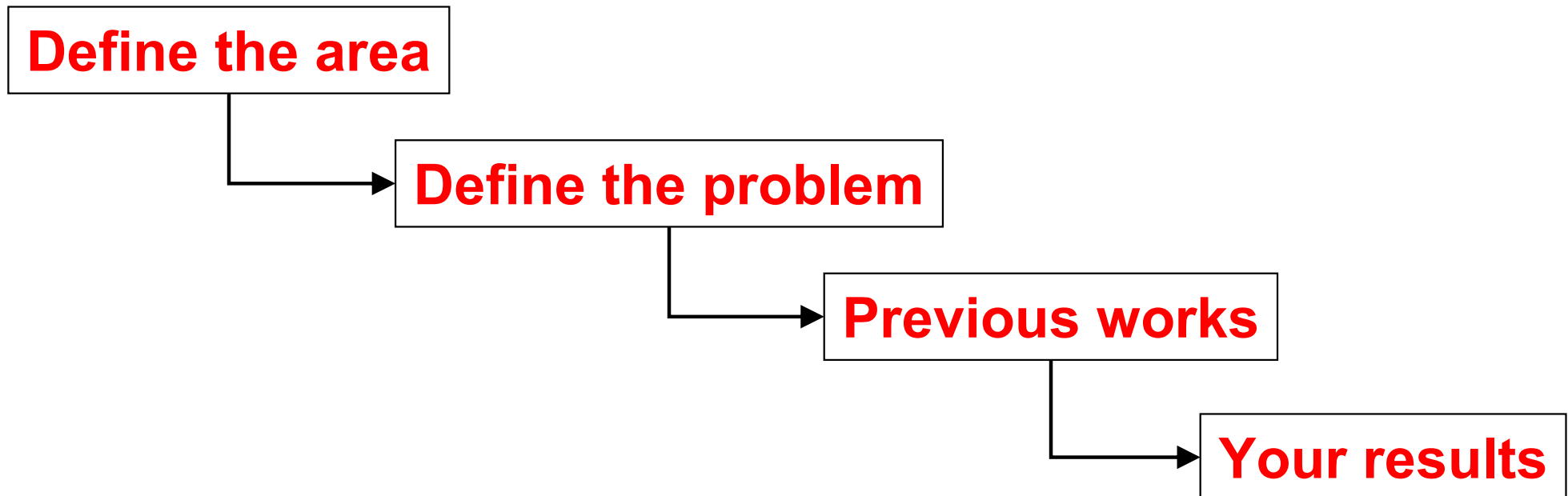
... Besides ... also enables ...

... We demonstrate ...



# Introduction

- Introduction is usually an extended version of abstract
  - Focus more on the background
  - State the importance of your work



# Data Commentary

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**Table 5 shows the most common modes of infection for U.S. businesses. As can be seen, in the majority of cases, the source of viral infection can be detected, with disks being brought to the workplace from home being by far the most significant. However, it is alarming to note that the source of nearly 30% of viral infections cannot be determined. While it may be possible to eliminate home to workplace infection by requiring computer users to run antiviral software on diskettes brought from home, businesses are still vulnerable to major data loss, especially from unidentifiable sources of infection.**

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# Data Commentary

---

**Table 5 shows ...**

**As can be seen, ... most significant**

**However, ...**

**While ... still ...**

**General Summary**

```
graph TD; A[General Summary] --> B[Differences, Similarities, Exceptions, Highlights, ...]; B --> C[Explanations, Implications, Discussions, Conclusions, ...];
```

**Differences, Similarities,  
Exceptions, Highlights, ...**

**Explanations, Implications,  
Discussions, Conclusions, ...**

# Conclusion

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- **Conclusion is also important**
- **Do not just rewrite your abstract**
- **Provide more thoughts**
  - **current limitations, future possibilities, ...**

# Conclusion 1

---

**Concepts reported here establish a baseline of materials, modeling approaches, manufacturing schemes, and device designs for transient electronic systems, sensors, actuators, and power supplies. The Si NMs are critically important elements, because their use enables sophisticated semiconductor components with both active and passive functionality. For the dielectrics and conductors, additional possibilities range from collagen to poly(lactic-co-glycolic acid) and from iron to zinc, respectively. Alternative modes of transience include absorption, corrosion, and depolymerization. The rates for these processes could, conceivably, be adjustable in real time and/or sensitive to the properties of the surrounding environment, determined by chemical or biological events, or changes in temperature, pressure, or light. Combining such possibilities in transience with ideas in soft, tissuelike electronics will further expand opportunities for applications in biomedical devices.**

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# Conclusion 1

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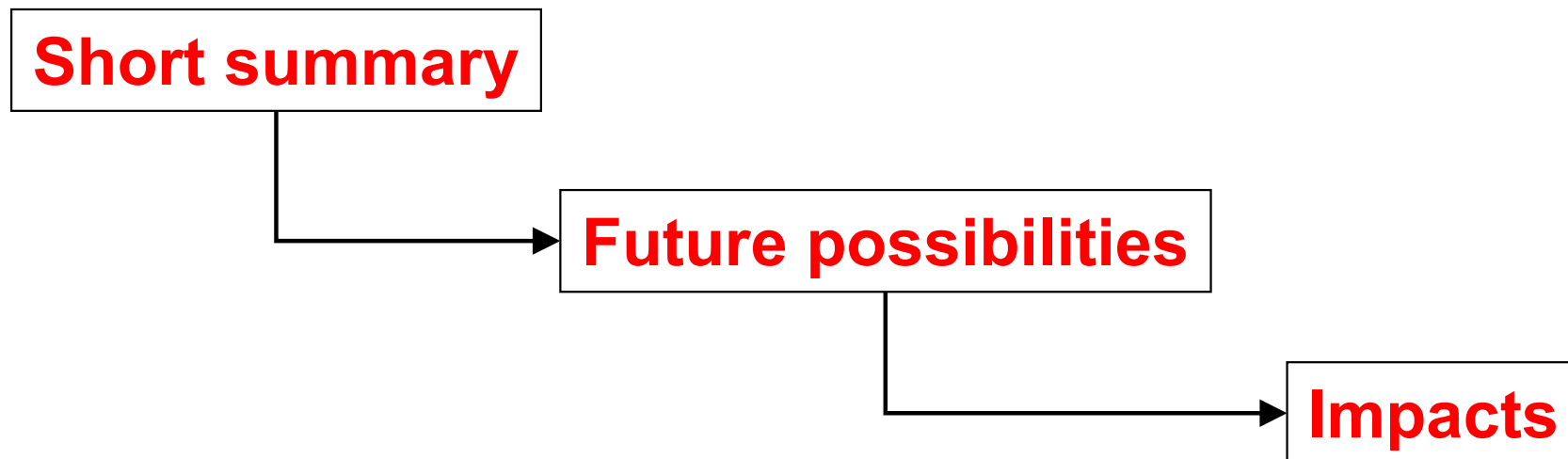
**Concepts report here establish a baseline of ...**

**... additional possibilities ...**

**... alternative modes ...**

**... could conceivably ...**

**... will further expand ...**



## Conclusion 2

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**In conclusion, we present high performance, dielectric based flexible thin-film filters based on transfer printing methods. These flexible filters obtained in this study not only illustrate their utilities to modulate device performance when integrating with microscale LEDs and PV detectors, but also exhibit ideal biocompatibilities both *in vitro* and *in vivo*. Besides LEDs and photodetectors, such filters can also be combined with other photonic devices such as microscale lasers and waveguides for versatile applications like beam steering and spectral shaping. Other research efforts would include the use of phase change materials to offer additional features like tunable and reconfigurable optical behaviors. In bioresorbable device systems for potential clinical uses, it is envisioned that biodegradable materials can be incorporated to realize natural degradation after implantation. To summarize, these findings clear away obstacles in universal fabrication of high performance flexible filters and open the door for their broad applications in biointegrated optoelectronic systems.**

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# Conclusion 2

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**In conclusion, we present ...**

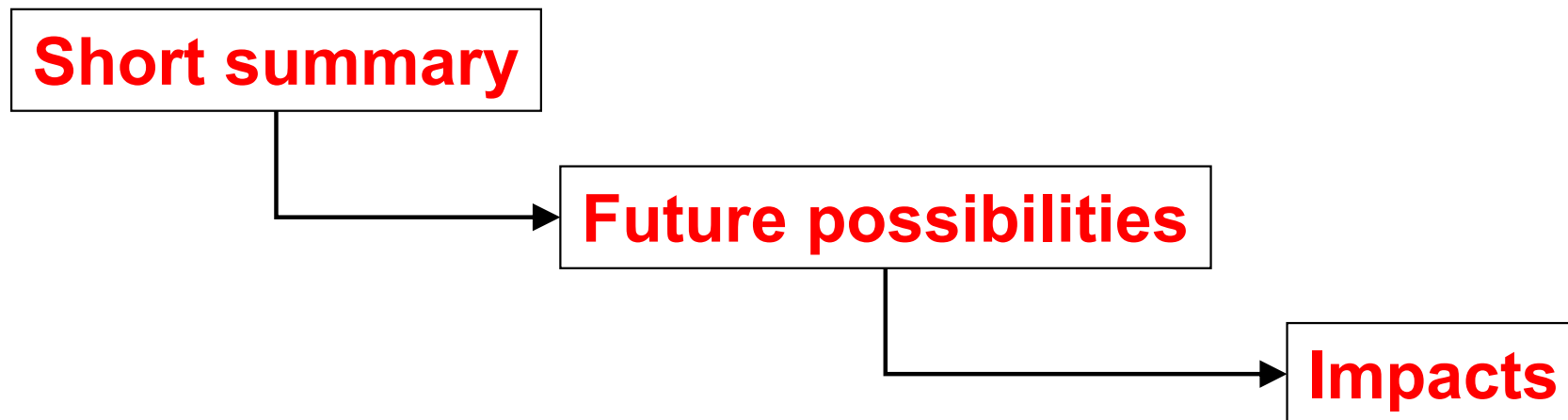
**... not only ... but also ...**

**... can also be ...**

**... other research efforts would include ...**

**... it is envisioned that ...**

**To summarize, these findings clear away obstacles in ...  
and open the door for ...**



# References

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- Cite important and relevant papers
- Cite original works, not only follow-up papers or review papers
- Compare your work with others', but be careful
  - "Standing on the shoulders of giants"
- *Reconcile*, do not be hostile

***"Our method is superior to previous approaches [1]"***

***vs.***

***"Our method is 30% faster compared to the results in [1]"***

# Tense of Your Paper

---

- **Generally, use present tense**
- **Occasionally, use past tense / present perfect**
  - **In the past few years, people have been working on ...**
  - **Previously, researchers developed a theory ...**
  - **you can use past tense in Experiments/Methods part**

# Double check your Text

---

## Avoid

- confusing words / sentences
  - be specific
  
- Overstatement
  
- Useless statement
  - e.g. *This result is very important.*
  
- Unsupported claims
  - use data or cite references
  
- Typos and grammar errors