



Designing and writing a review paper

David J. Parkinson

Professor emeritus, University of Saskatchewan

28 January 2022

References

- Archibald, Douglas, and Maria Athina Martimianakis. Writing, reading, and critiquing reviews. *Canadian Medical Education Journal*, June 2021, pages 1–7, doi:10.36834/cmej.72945, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8263049/>, accessed 24.01.22
- Author Services, Taylor and Francis. What is a review article? Informa UK, 2022, <https://authorservices.taylorandfrancis.com/publishing-your-research/writing-your-paper/how-to-write-review-article/>, accessed 24.01.22
- Baethge, Christopher, Sandra Goldbeck-Wood, and Stephan Mertens. SANRA—a scale for the quality assessment of narrative review articles, *Research Integrity and Peer Review*, volume 4, article number 5 (March 2019), doi:10.1186/s41073-019-0064-8, <https://rdcu.be/cFCWT>, accessed 24.01.22
- Haery, Leila. How to write a scientific review article, Addgene, February 2017, <https://blog.addgene.org/how-to-write-a-scientific-review-article>, accessed 24.01.22
- Lundström, Markus. The political economy of meat, *Journal of Agricultural and Environmental Ethics*, volume 32, 2019, pages 95–104, DOI <https://doi-org.cyber.usask.ca/10.1007/s10806-019-09760-9>, shareable link <https://rdcu.be/cFGNO>, accessed 25.01.22
- PRISMA. Transparent reporting of systematic reviews and meta-analyses, <http://www.prisma-statement.org>, accessed 24.01.22
- Sarwat, Syed Ghazi. Materials science and engineering of phase change random access memory, *Materials Science and Technology*, volume 33, 2017, issue 16, pages 1890–1906, doi.org/[10.1080/02670836.2017.1341723](https://doi.org/10.1080/02670836.2017.1341723), <https://www.tandfonline.com/doi/full/10.1080/02670836.2017.1341723>, accessed 25.01.22
- Tze, Virginia M. C., Lia M. Daniels, and Robert M. Klassen, Evaluating the relationship between boredom and academic outcomes: a meta-analysis, *Educational Psychology Review*, volume 28, number 1, March 2016, pages 116–44, <http://www.jstor.org/stable/24761221>.

What this presentation will and won't do

This session is about the composition of free-standing review papers.

By the end of this session, you will have been introduced to the main methods of review (systematic, scoping, and narrative).

You will have identified the structural elements of a review paper.

You will have considered three examples of review papers from different disciplines (psychology, political economy, and engineering)

You will not be learning about search techniques to identify sources; this was the subject of my presentation for IIITD's Academic Writing Lab on 8 March 2021, on literature reviews (slides and script available on request).



Tasks for the writer of a review paper

What is the current state of discovery in my field? Where do gaps or conflicts exist?

What are my tasks? Summarise, synthesise, interpret, criticise ...

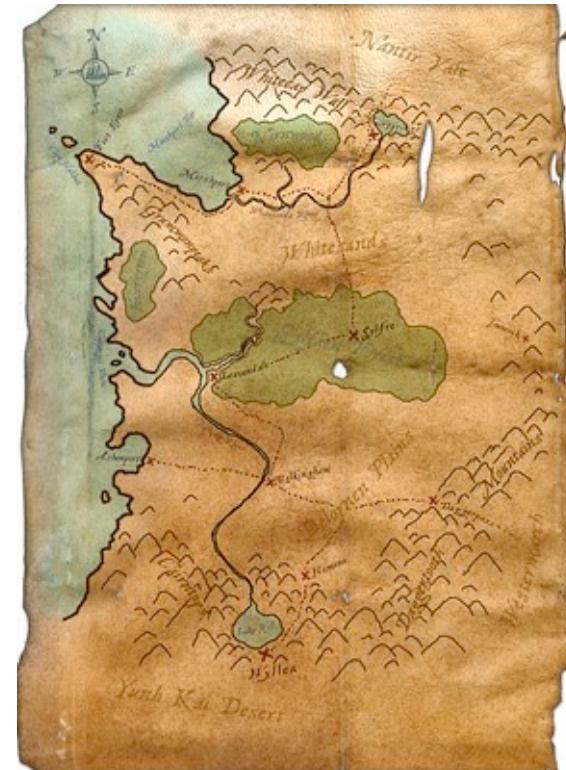
What type of review am I writing? Systematic, scoping, narrative ...

Should I be using a formal procedure (PRISMA, SANRA)? Should I use a more informal procedure (question, approaches, critique and predictions)?

Should I just copy what previous researchers have published? What does it mean to curate their findings?

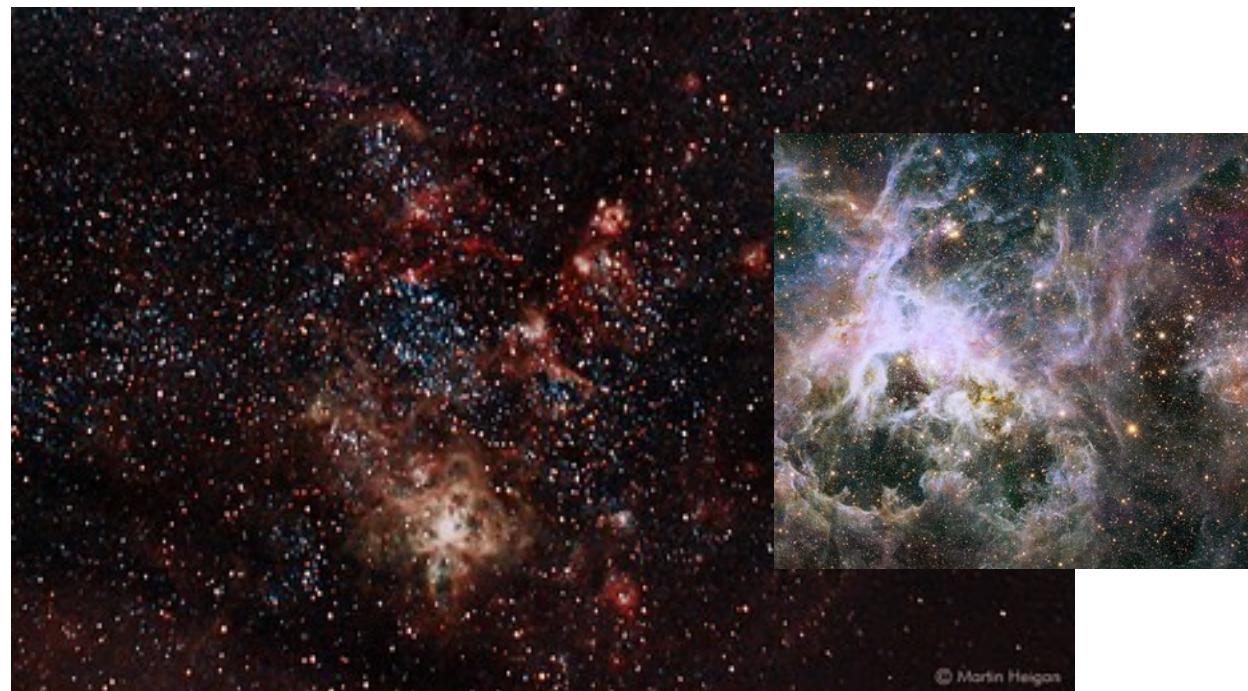
Do my comments inform my conclusions?

How far should my findings be verifiable?

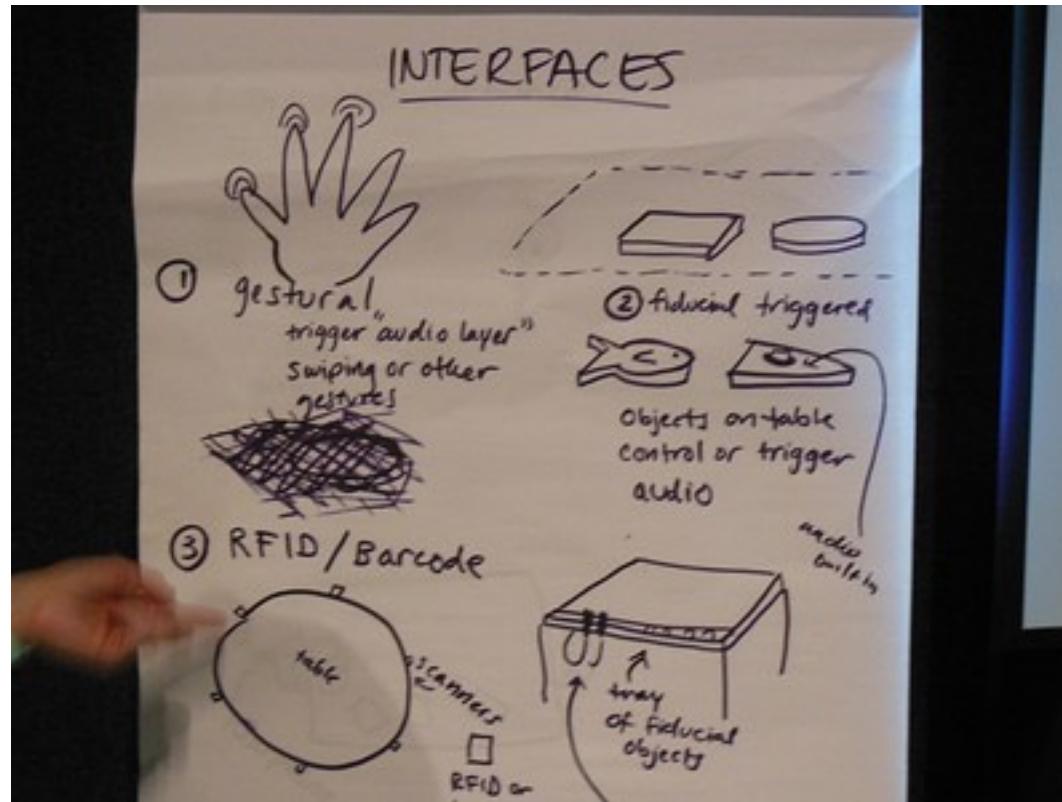


8 key things to consider when writing a review article (Author Services, Taylor Francis)

1. What are the **expectations** within which you must work (in your course, program, or the journal for which you are writing) – length, style, review method, documentation?
2. What is the **scope** of your review? How can it be made manageable, clear, and interesting?
3. Where do you find the **sources** you will evaluate? (For a presentation that aims to answer this question, write to me at djparkinson@shaw.ca for my lecture notes from 8 March.)



4. Draft your title and keywords; these will certainly evolve as you go along. If you can, make a preliminary attempt to write an abstract, even if this is only three sentences.



5. **Justify** your focus; why is it necessary now? Why does it matter for specialists? Why does it matter for non-specialists? Answer all these questions to increase the relevance and impact of your review. (You just wrote the first draft of your introduction.)



6. Be **fair**. In your discussion, go beyond description into critique. If there is a debate in the research, present both sides and suggest a solution.
7. Identify the **trends** and key advances. Show where further research will be most valuable. What questions lie ahead?
8. **Three Cs:** revise for coherence, clarity, and correctness.



Leila Haery's advice (#1)

Get and use a reference management program (e.g., EndNote, Papers, Mendeley, etc.)

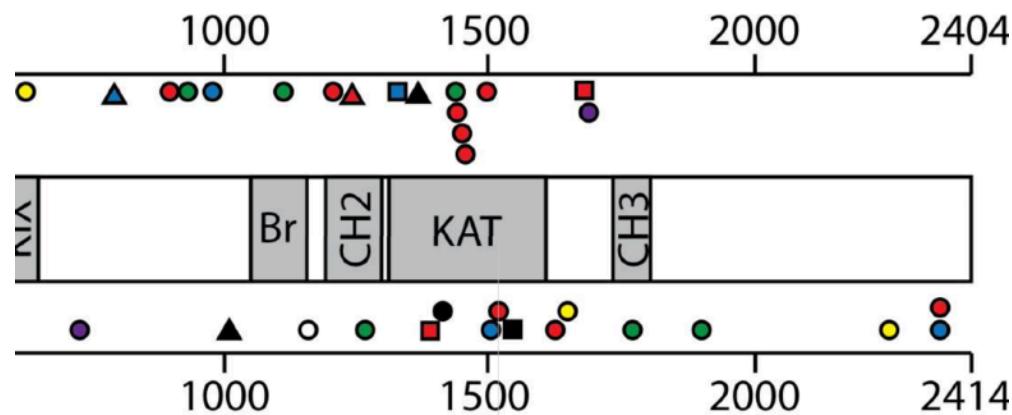
You're going to be managing a lot of references. I cite as I write, meaning I use the software to add the citations in real time as I write. Things are going to get a little crazy (meaning you are probably going to cite hundreds of references) and it's better to keep your references organized from the beginning. I also recommend using the citation style of (Last name, Year) in the document while writing, because it helps you later on to remember where you read particular studies or experiments. Later, you can easily convert the citation style to whatever the journal requires. Using the (Last name, Year) format also has the benefit of exposing you to relevant researchers in the field. Finally, you can sound credible and cool when you casually mention "Haery et al., showed that MYC expression was increased..." when discussing the review topic with your peers.



(#2)

Curate and present some useful data

Typically lists and pictures are the most useful parts of reviews. These could be in the form of figures/schematics or tables. And don't forget to include citations so that people can go back and read the original reference for the data. For example, we summarized how frequently each member of a class of proteins was mutated, as reported in various studies. We made a table that listed each protein in the class, then for each protein we listed all the studies that reported mutations in that protein (including how frequently a mutation was found and the size of the study). This was useful because you could easily see how frequently each protein was mutated, you could see how big the studies were, and you could find the original paper if you wanted to learn more. Another example: we made a schematic of all the proteins in the class that showed the relative sizes and the conserved domains. This information was available in GenBank, but it was useful to present it all in one place to get a sense of the similarities and differences among proteins in the class. (Haery)



Comments on Leila Haery's blog post on Addgene

Thomas 2017-02-17, 7:32:53 AM

Honestly I don't think undergraduates should write reviews. PhD students shouldn't write reviews. A review is more than a mere summary of the literature out there. It is a critical evaluation of the literature out there. How can someone without experience evaluate whether claims in papers are true or most likely wrong? It just fuels the inflation of useless reviews and undermines the very idea of a review.

Stella Dorothy 2019-07-08, 5:26:19 PM

Yes, I totally agree with your idea. Usually new researchers try to write reviews just to increase their number of publications but that is really not a good idea because if they really want to have excel in their fields, it would be much better to join any reviewer board of any journal as a junior reviewer and try to review as many papers as they can it will definitely help them and will enhance their knowledge to become a great scientist.

Novaira Rizwan 2019-10-22, 2:43:20 AM

I liked the way you cheered up and motivate every beginner to at least put some effort irrespective of what conclusion it would come up with. You actually mentioned most of the hurdles encountered with an appropriate and motivating suggestion which you yourself had implemented. THANK YOU... :)

Ree Nadeau 2020-07-08, 9:12:28 AM

I want to write a review, but for each topic I look up it seems there's already been a lot of research done - including someone else's review. Do you have any advice on how to find a topic that hasn't already been reviewed?

Jennifer Tsang (Addgene) 2020-07-08, 10:38:50 AM

Hi Ree,

Great question! You can try to look for something within the topic that wasn't covered in other reviews or new applications. Another thing to keep in mind is that there's always new research being published. We are often updating our blog posts with new research studies, so it's likely that there are things a previous review did not include.

Three sample review papers

1. Markus Lundström, The political economy of meat, *Journal of Agricultural and Environmental Ethics*, volume 32, 2019, pages 95–104, DOI <https://doi-org.cyber.usask.ca/10.1007/s10806-019-09760-9>, shareable link <https://rdcu.be/cFGNO>, accessed 25.01.22

Abstract

This paper discusses variegated scholarly approaches to what is here typified as a *political economy of meat*. Identified as a multifaceted, transdisciplinary and most dynamic field of research, inquiries into the political economy of meat imbricate key issues of social and economic development, across the human–animal divide. While some scholars interpret livestock production as “a pathway from poverty”, others observe deepened marginalization and exploitation. The argument raised in this paper is that concise engagement with multiple critical perspectives may facilitate further explorations into the social dynamics that characterize the political economy of meat.

Keywords: meat consumption, livestock revolution, development, commodification, speciesism



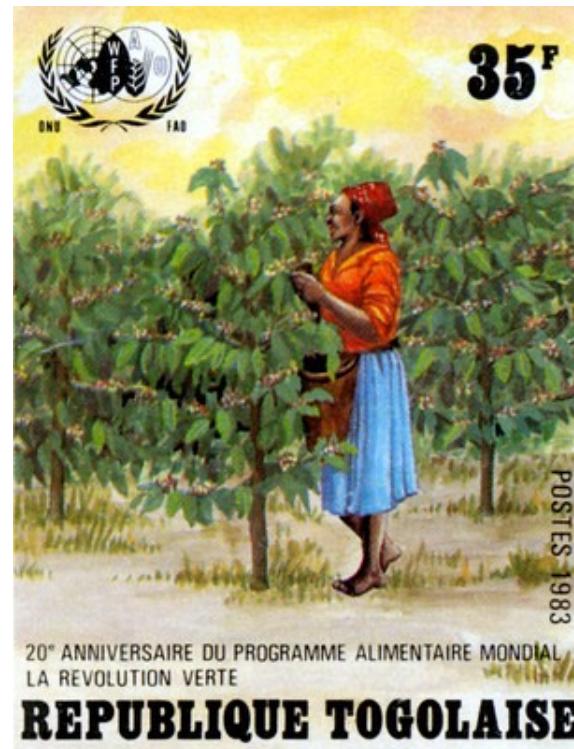
Introduction: historical context

Historical background: ‘first food regime’ (free trade), ‘second food regime’ (state subsidies), ‘third food regime’ (corporatization). This paper aims to facilitate critical examination of globalized meat consumption by connecting a variety of scholarly approaches.’

Global meat consumption

Rural development – developing world, ‘Green Revolution’, ‘Livestock Revolution’, ‘pathway from poverty’ through technological development and increased market access

Counter-view – ‘small livestock holders report being highly dependent on agri-food companies’ and severely indebted, with ‘severe competition for agricultural land’ resisted by ‘peasant movements’



Political economy of meat

- entails conflict between ‘dominant economic arrangements’ and ‘counter movements that struggle for equality and autonomy across the food chain’: ‘food sovereignty’
- global justice: the meat industry as an inefficient way of producing food, with consequent inflation of food prices
- commodification: economic and cultural transformation of animals into products, ‘propelled by generating profit, not food’
- speciesism: the hierarchical division between humans and [other] animals, critiqued in ‘critical animal studies’



I'm going to move quickly through the next example.

2. Virginia M. C. Tze, Lia M. Daniels, and Robert M. Klassen, Evaluating the relationship between boredom and academic outcomes: a meta-analysis, *Educational Psychology Review*, volume 28, number 1, March 2016, pages 116–44, <http://www.jstor.org/stable/24761221>.

Abstract

The experience of academic boredom among students may be universal; in fact, almost all students complain at least occasionally about being bored in class or while studying. Despite the perceived negative influence of boredom on learning, there has been no synthesis of empirical findings underscoring how boredom relates to academic outcomes. Therefore, the purpose of this study is to meta-analyze the research exploring the relationship between students' academic boredom and their motivation, study strategies and behaviors, and performance.



A total of 29 studies, involving 19,052 students, met the inclusion criteria. The overall effect size, $\bar{r}=-.24$, was significant, $p < .001$. In subgroup analyses, the negative effect sizes were found to differ between secondary and post-secondary students, and boredom experienced in class had greater negative impact on students' academic outcomes than boredom experienced while studying. In addition, a significant differential impact of boredom on academic motivation, study strategies and behaviors, and achievement was found. These findings suggest that education professionals should identify strategies to alleviate students' boredom in academic settings.

Key words: meta-analysis, academic boredom, learning and achievement

Identifying the gap

Based on Pekrun's framework of nine 'academic emotions' (enjoyment, hope, pride, relief, anger, anxiety, hopelessness, shame, boredom), with boredom comparatively understudied: 'no synthesis of empirical findings examining the relationship between boredom and academic outcomes has been conducted.'

Definition: 'an experience associated with a negative attitude toward an activity, along with a reduction of physical actions, an inability to specify what one desires, a passive attitude hoping for a change from an external source, and a sense of time distortion' ... 'a negative emotion whereby one cannot meaningfully engage in a task, is unable to sustain required attention, and attributes an external environment as a cause of this aversive feeling.'

Boredom is a state of mind found in those who cannot be bothered to learn new ways of enjoying themselves.

Control-Value Theory

'A student perceives a lack of value in, coupled with either an overwhelming high control or lack of control over' a given task. The individual's focus is directed to the emotional experience, so that available cognitive resources are lowered, hindering the use of meta-cognitive strategies and consequent reduction of performance. If the topic or task are overwhelmingly difficult, the students may lose confidence in finding relevance and value in learning them and focus instead on how bored they are – 'tune out' or depart.

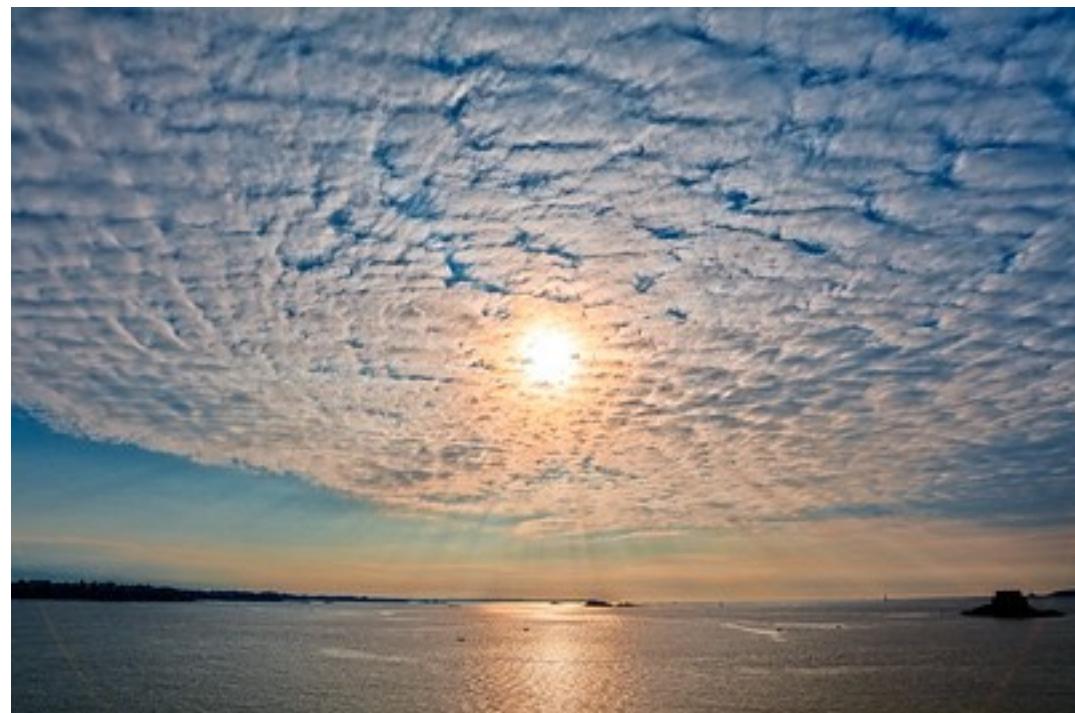
Academic Boredom

- directly linked to academic learning, classroom instruction, and achievement
- review of studies of students' self-reports in different countries
- 'These empirical findings thus suggest that boredom in educational contexts seems to be a universal academic emotion, and one that is frequently experienced by students across age groups, educational needs, and ethnicity.'

Influence on Academic Outcomes

Systematic Review in Meta-Analysis

Results



Discussion

- ‘Although class-related boredom has a stronger negative association with student academic outcomes ... than learning-related boredom ... the difference in magnitude may not reach practical significance’ – due perhaps to overlap in topics and materials (textbooks, methods)
- Diminishing phenomenon for university students compared with high school students, but ‘a unitary effect – negative in nature – on both secondary and post-secondary school students’ learning’

Limitations

Conclusions

- '[S]even situational antecedents to boredom – being over-challenged, being under-challenged, being bored by an unchanging routine, not finding meaning in learning, having better things to do than be in class, disliking the teacher, and feeling uninvolves – can be the focus of intervention.
- For university students, ‘clear learning goals and differential instruction’ may be good adaptive strategies.

Future Directions

References



3. Syed Ghazi Sarwat, Materials science and engineering of phase change random access memory, *Materials Science and Technology*, volume 33, 2017, issue 16, pages 1890–1906, doi.org/10.1080/02670836.2017.1341723, <https://www.tandfonline.com/doi/full/10.1080/02670836.2017.1341723>, accessed 25.01.22

Abstract

Having monopolised the optical data storage industry since the very beginning, phase change materials are now being intensively explored for next-generation electronic data storage, referred to as phase change random access memory (PCRAM).

Because phase change materials are electrically programmable; capable of reversibly switching between two stable structural phases of contrasting electrical properties, besides data storage they also enable data computation.

For these reasons, PCRAM envisages to overcome both miniaturisation and data flow bottlenecks, challenges which current silicon charge-based technology is failing to cope with.

This review, while reasoning the need for a switch to a newer data storage technology, and comparing PCRAM with other data storage and computation platforms, comprehensively takes stock of the benefits and challenges associated with PCRAM.

This review also critically investigates and associates the materials science and physics, such as the atomic structure and bonding, thermodynamics and kinetics of the phase transformation, with the PCRAM device characteristics and performance.

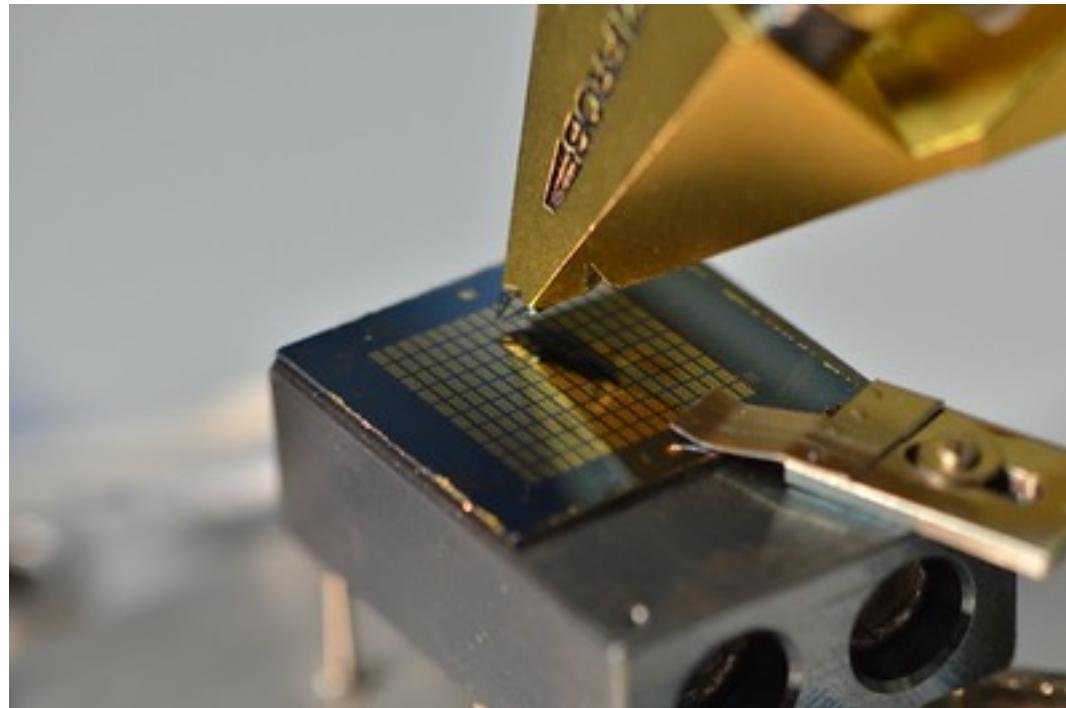
Various device design-concepts and requirements are reviewed. Recent advances, and evolution of newer platforms, including those relating to neuromorphic computing and photonic memory are also described.

Keywords: phase change materials, phase change memory, transistors, thermodynamics

Introduction

- data computation and storage
- limits of miniaturization and data flow
- combined solution through alternate technologies
- e.g. co-location of memory and processor
- new problem of low storage densities
- hence interest in phase change memory

Purpose of this review: identify important concepts in phase change random access memory (PCRAM), and discuss recent advances



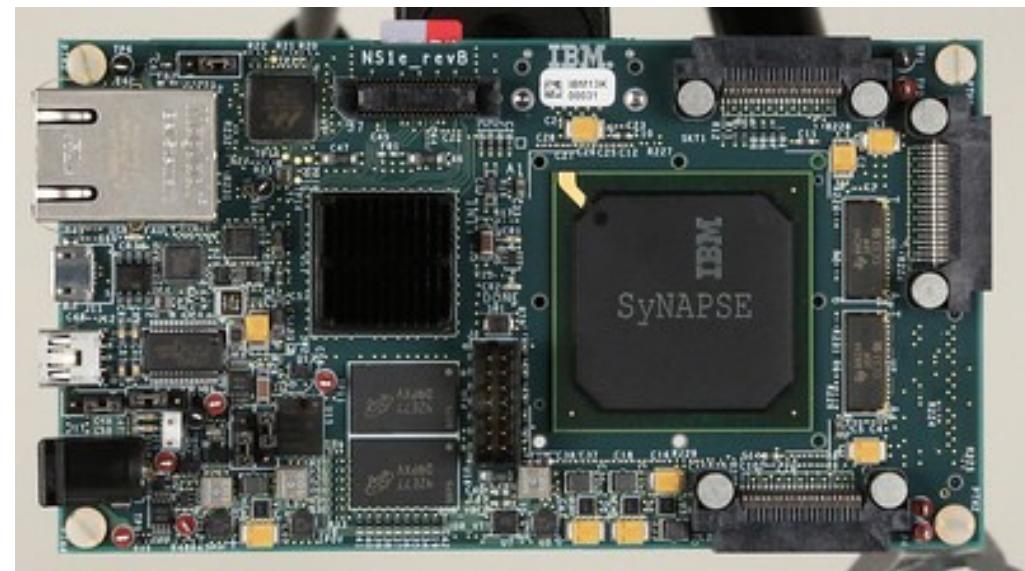
Context

- limits of silicon technology (wiring, power, heat)
- ‘Phase change materials can be electrically programmed’ e.g. resistance ratio between a material’s amorphous (high resistance) and crystalline (low resistance) phase.
- switching by thermal, optical, or electrical stimuli, singly or in combination
- ‘An efficient PCRAM device is one which switches at minimum electrical power.’
- ‘Interestingly, although phase change materials were reported in 1968, it was the disclosure of nanosecond timescale switching behaviour in 1987 [25], which fascinated the scientific community. Today, a plethora of research could be found on phase change materials and memory [11, 22, 26–28], the majority of which being on the quest and optimisation of materials, and cell’s geometry.’
- Alternate technologies:
 - **dynamic RAM** (DRAM: transistor+capacitor) – leaky, energy intensive, decelerated by recharging;
 - **static RAM** (SRAM: ‘flip-flops, constructed from four to six transistors’) – ultrafast but bulky and expensive;
 - **Flash** (different transistor type, with ‘control’ and ‘floating’ gates) – slow, not energy efficient, lacking endurance;
 - **ferroelectric RAM** (FRAM: a ferroelectric material ‘sandwiched between plates of a capacitor’) – high endurance, but same disadvantages as DRAM and SRAM, with limited storage;
 - **magnetoresistive RAM** (MRAM: ferromagnetic plates separated by an insulating layer) – with spin-transfer torque (SST-MRAM), close to commercialisation but with ‘a memory cell architecture that limits its device density’;
 - **resistive oxide memory** (RRAM) – fabrication-friendly and free from miniaturisation issues’ but hard to control

Context conclusion: ‘If PCRAM is to be compared against SST-MRAM and RRAM/CBRAM, which are its fierce competitors for non-volatile data storage, it would fall short on process speed, and endurance limits. However, PCRAM is more matured a technology, and phase change materials are already well-studied and mass produced for optical data storage, giving PCRAM an upper hand.’

Syed Ghazi Sarwat then reviews research on each of the following key topics in the ‘Science of phase change materials’:

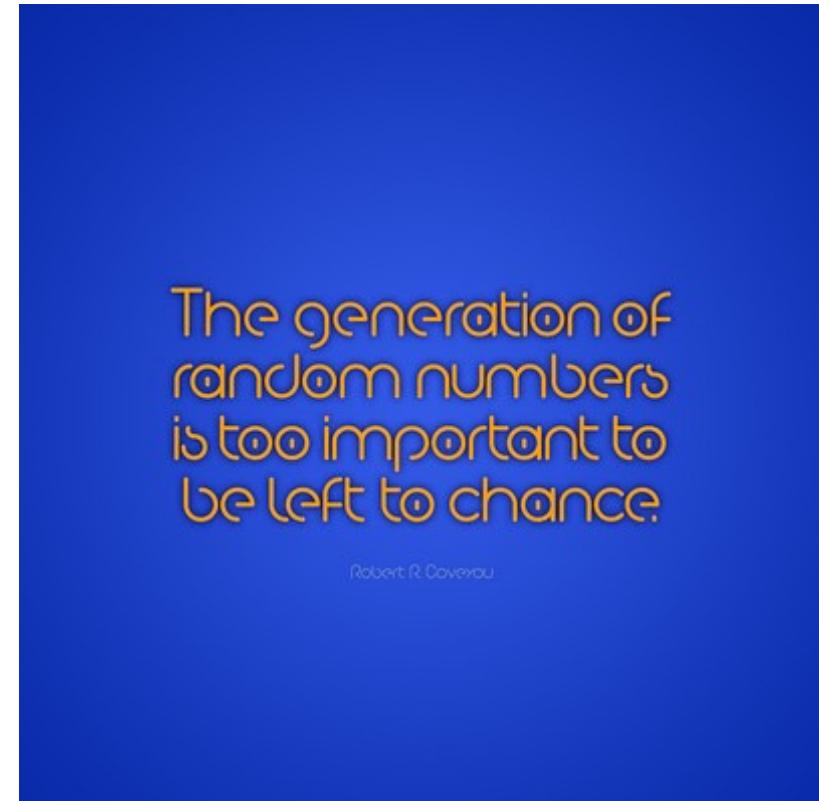
- Threshold voltage: a key player – a ‘variety of models’ summarised; voltage-current instability; reversibility
- Materials for phase change memory – crystallisation rate; archival stability; endurance limit; nucleation dominated; growth dominated; atomic bonding and structure;
- Device design – compositional design; cell design (dimensions, capping/cladding layers, contact electrodes, resistance drift, device challenges)
- Recent advances – interfacial memory; super-fast phase transformation; zero-mass density change phase change materials; CNT and graphene nano-gap electrodes; graphene thermal layer; projected memory devices; photonic memory
- The von Neumann bottleneck (the limit on the transmission of data to and from memory) – solvable by locating data storage and data computation in the same space? In PCRAM, ‘[e]ach time a pulse is swept in the amorphous matrix, the number and sizes of the crystallites grow’ and resistance decreases.
- Neoromorphic computing – ‘the emulation of neurons’ with ‘synaptic weight’ – Sarwat defines: ‘synapse is a tissue that connects dendrites (think of it as inputs) to axons (think of it as output) and synaptic weight defines the strength of the connection’.



Sarwat's discussion reaches this **goal**:

Recently, scientists at IBM have demonstrated a prototype stochastic phase change neuron [91], which stores membrane potential in the phase configuration of a phase change material, thereby imitating the neuron soma. This piece of work is worthy of praise as it brings to advantage and use the unavoidable intrinsic variations in PCRAM cell's resistance typically observed after every run and over time (remember from previous discussions that stochastic resistance variations has been a severe downside for the PCRAM data storage technology).

This review has 94 references.

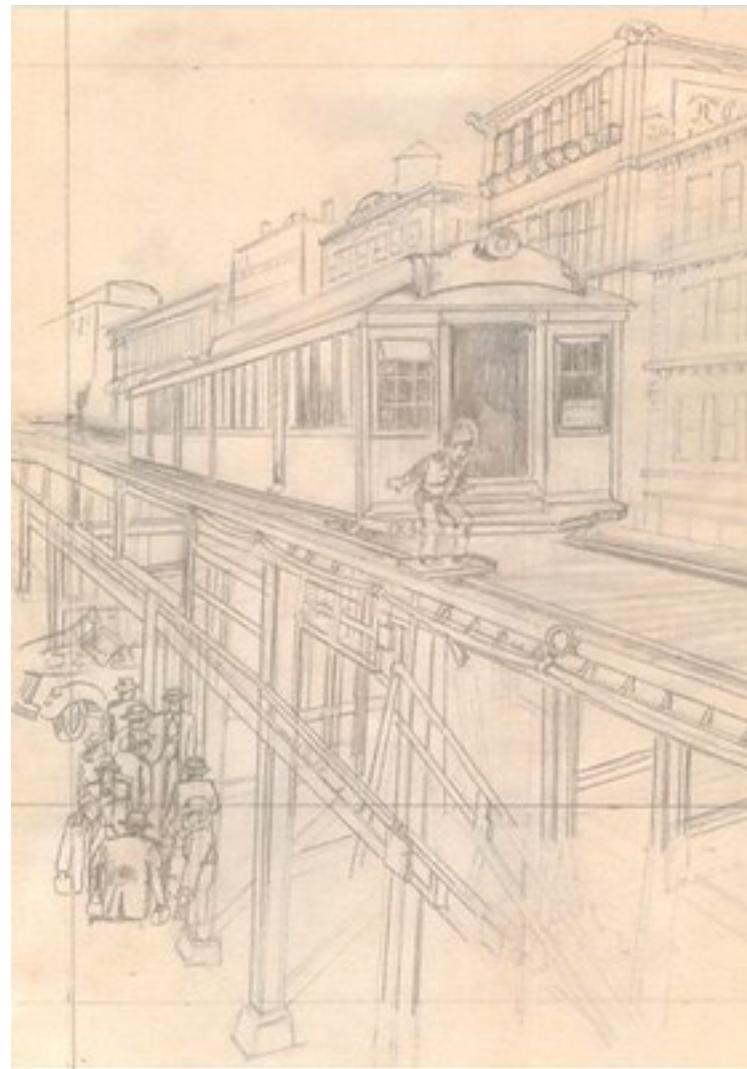




Syed Ghazi Sarwat describes his approach to writing a review paper (<https://authorservices.taylorandfrancis.com/writing-a-scientific-literature-review/>, accessed 25.02.22) ...

Take the reader on a journey

In my experience, the key to a good literature review is its ability to tell a story. It must introduce a main topic, and then take the reader on a journey, coherently describing the concept from rudiments all the way up to sophisticated advances. A review article might be considered as lecture notes compiled into one big file – but at the same time, the author must never take the reader for granted and needs to start with the basics, gradually unravelling the intricacies.



Write an article that would have been useful for you when you first encountered the topic.

Before starting any piece of scientific writing, I carry-out thorough introspection. I consider the difficulties and knowledge gaps I faced when I was first introduced to the topic. I then think of myself as the reader and write in a way that meets the curiosity I had.



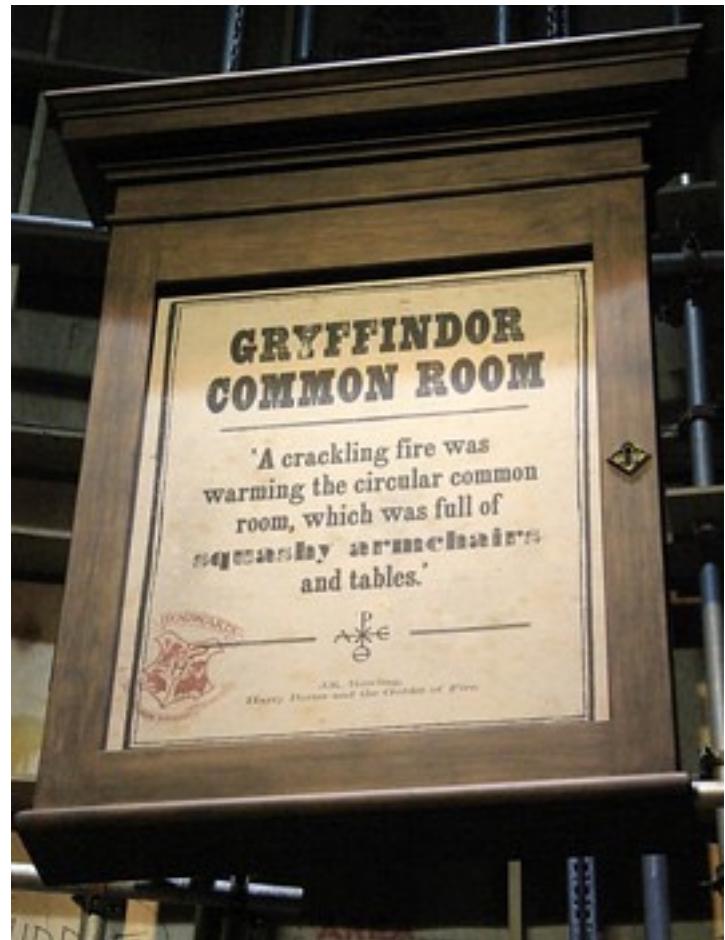
Write with confidence

Writing a literature review, you become an ambassador for the subject, an author owning the story. You no longer summarize the literature, but instead provide reasoning like an expert in the subject, and this is crucial.



Connect with other authors

I take interest in connecting with the authors of the papers I find interesting. I begin to follow their research and scrutinize their choice of projects. This makes learning and writing more interesting, but also helps me think about new ideas and scientific explanations.



5 top tips

1. Keep the language simple. Assume that your audience are not experts in the field.
2. Use referencing software – you are never going to get the article exactly right on first draft. To make life easier, invest time to learn this skill.
3. Get the outline of the review right – your review will likely require multiple iterations, and a strong outline can make things easier further down the line.
4. Always try to include the highest quality version of the images, and always invest time drawing the schematics as best you can (I always go back to the Figures I liked in the literature before I start making my versions).
5. Lastly, take the opportunity of writing a literature review seriously. This is not just an opportunity for you to get an article published, but also to get started with your research. Developing a good understanding of the field you will be working on, beforehand, expedites your progress immensely.

Thank you, Syed Ghazi Sarwat.

Thank you, participants in this session.

Thank you, Dr Payel Chattopadhyay Mukherjee, Rushali Saha, and the staff of the Academic Writing Lab at IIITD for this opportunity.

Sources of images (in order of presentation)

"20130308-FNS-LSC-0384" by [USDAgov](#) is licensed under [CC BY-NC-ND 2.0](#)

"D&D: South of the Whitecaps Campaign Map" by [Diablo Azul](#) is licensed under [CC PDM 1.0](#)

"The Tarantula Nebula (30 Doradus)" by [Martin_Heigan](#) is licensed under [CC BY-NC-SA 2.0](#)

"New Hubble infrared view of the Tarantula Nebula" by [Hubble Space Telescope / ESA](#) is licensed under [CC BY-NC-ND 2.0](#)

"Early Sketches" by [openexhibits](#) is licensed under [CC BY-NC 2.0](#)

"Canon EF 50mm f/1.2" by [Thomas Hawk](#) is licensed under [CC BY-SA 2.0](#)

"Sara Greenberger Rafferty leads a workshop with the New York Arts Practicum" by [mandiberg](#) is licensed under [CC BY-NC 2.0](#)

Haery, Leila, Thompson RC, Gilmore TD. Histone acetyltransferases and histone deacetylases in B- and T-cell development, physiology and malignancy. *Genes Cancer*. 2015 May;6(5-6):184-213. doi: 10.18632/genescancer.65. PMID: 26124919; PMCID: PMC4482241.

"Harris Ranch feedlot in California" by [Farm Sanctuary](#) is licensed under [CC BY-SA 2.0](#)

"1983 - 20th Anniversary of the Green Revolution" by [Paul-W](#) is licensed under [CC BY-NC-ND 2.0](#)

"Food sovereignty in Venezuela" by [Global Justice Now](#) is licensed under [CC BY-NC-SA 2.0](#)

"Artister mot speciesism" by [djurensratt](#) is licensed under [CC BY-NC 2.0](#)

"The Bored Student" by [canonsnapper](#) is licensed under [CC BY-SA 2.0](#)

"Boredom definition" by [Robin Hutton](#) is licensed under [CC BY-NC-ND 2.0](#)

"Saint-Malo Sunset" by [Bold Frontiers](#) is licensed under [CC BY-NC-ND 2.0](#)

"Scene at Nek Chand Fantasy Rock Garden - Chandigarh U.T. - India - 02" by [Adam Jones, Ph.D. - Global Photo Archive](#) is licensed under [CC BY 2.0](#)

"Projected phase-change memory devices 2" by [IBM Research](#) is licensed under [CC BY-SA 2.0](#)

"IBM SyNAPSE neuromorphic chip on board" by [IBM Research](#) is licensed under [CC BY-ND 2.0](#)

"Stochastic (lock)" by [Brett Jordan](#) is licensed under [CC BY-ND 2.0](#)

"Cover sketch of my latest book" by [Michael Vance1](#) is licensed under [CC BY 2.0](#)

"Korean Head Start Program - Pyeongtaek, South Korea - 31 August 2012" by [USAG-Humphreys](#) is licensed under [CC BY-NC 2.0](#)

"File:Coin of Azilises showing Gaja Lakshmi standing on a lotus 1st century BCE.jpg" by [Uploadalt](#) is licensed under [CC BY-NC-ND 2.0](#)

"The Making of Harry Potter 29-05-2012" by [Karen Roe](#) is licensed under [CC BY-SA 3.0](#)