學術研究寫作的倫理實踐
Responsible conduct of research (RCR) and *research writing*

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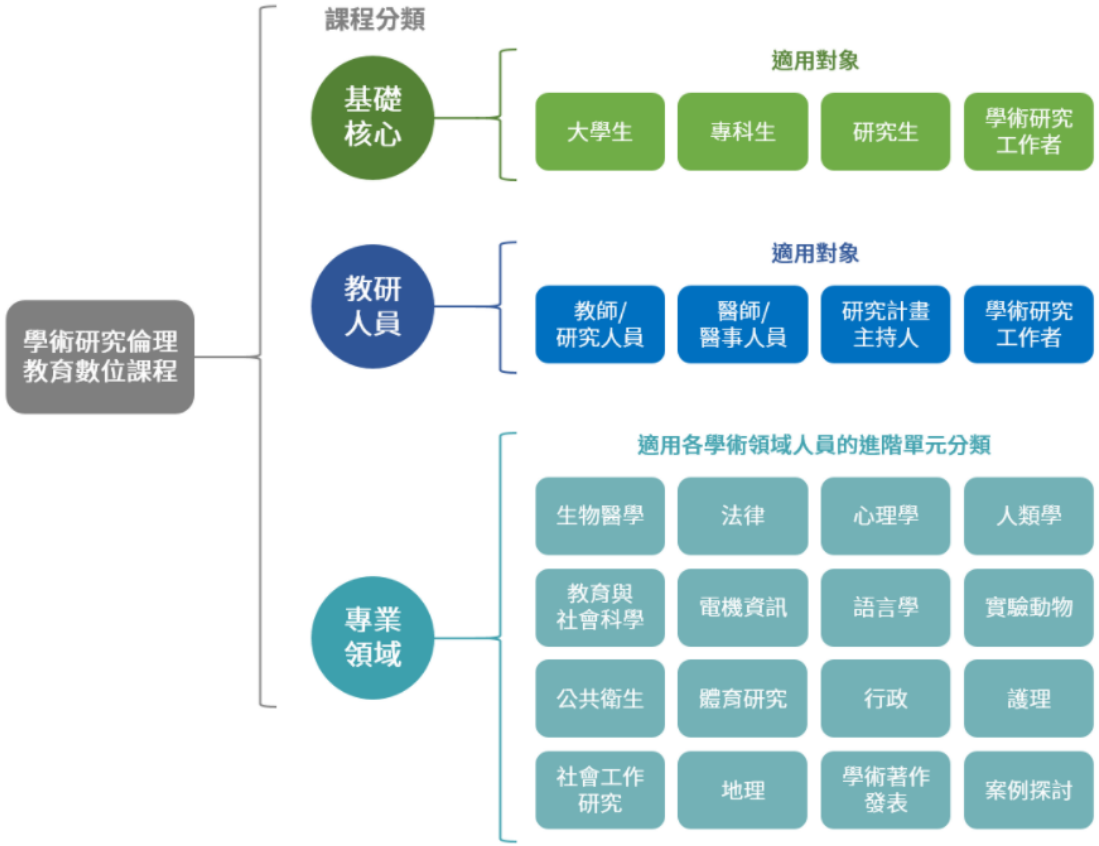
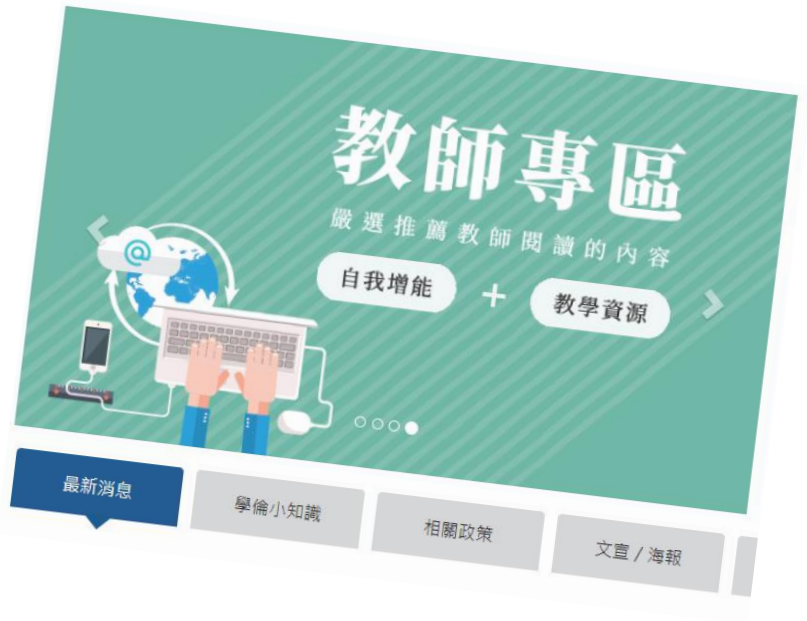
Center for Taiwan Academic Research Ethics Education

學術研究倫理教育數位課程分為基礎核心、教研人員、專業領域三大類別





臺灣學術倫理教育學會
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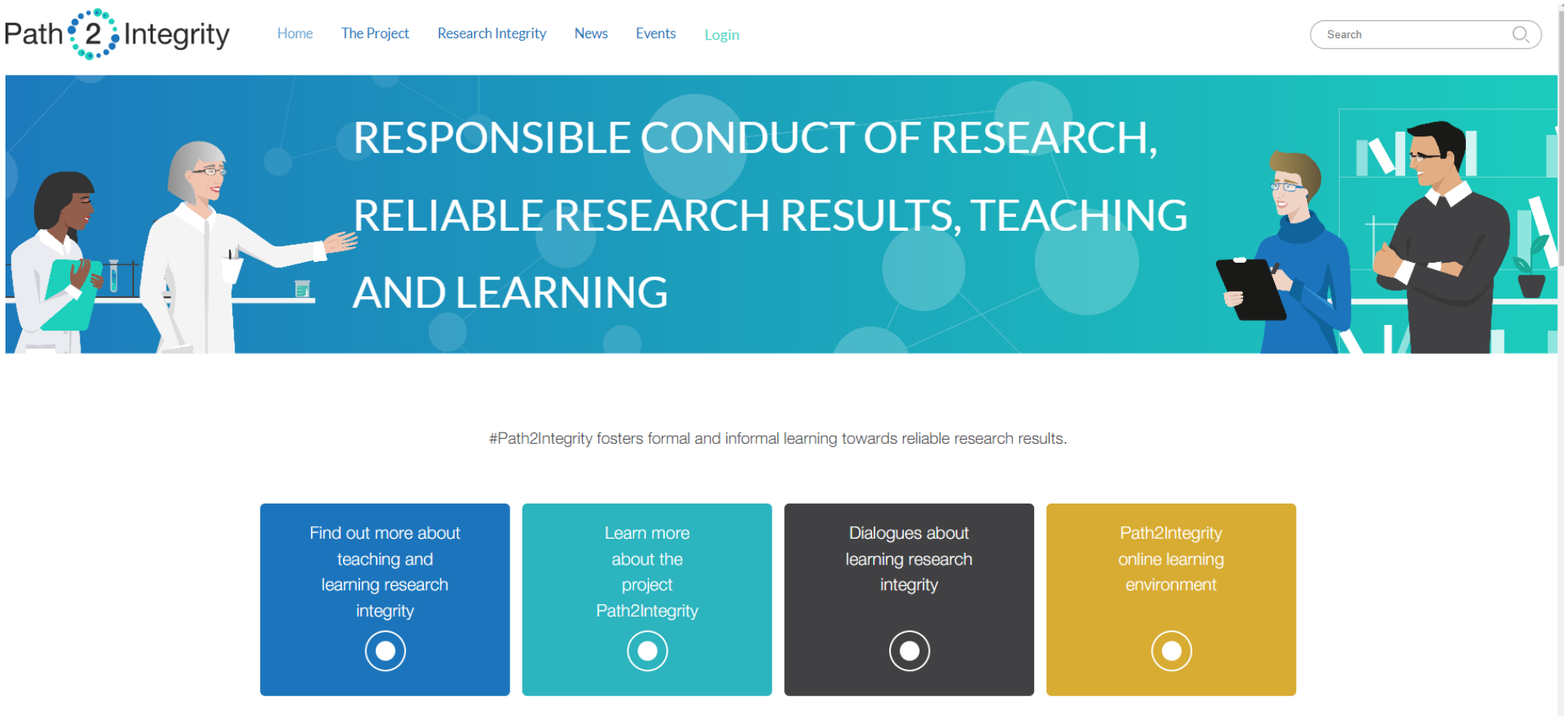
Path 2 Integrity



國立清華大學

教育部教學實踐研究計畫

A flipped classroom for enlightened minds and crafted works

一堂深思細讀的翻轉寫作課(110）

Reading for writing: A literacy-oriented approach for ERPP instruction

翻轉讀寫：以閱讀為本之素養導向研究論文寫作教學（ 109）

Argue to learn: An argument-driven approach (ADA) for ERPP instruction

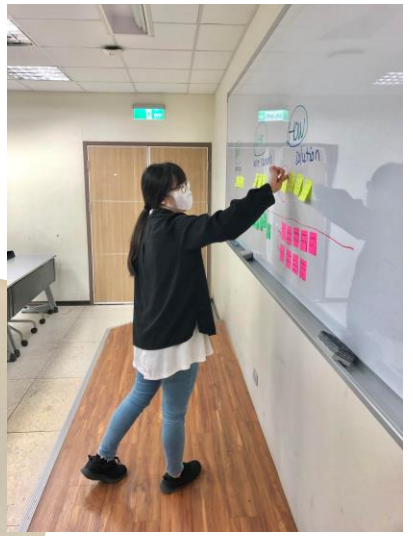
有理有據之謂論：論證導向之科技論文寫作教學（ 108）

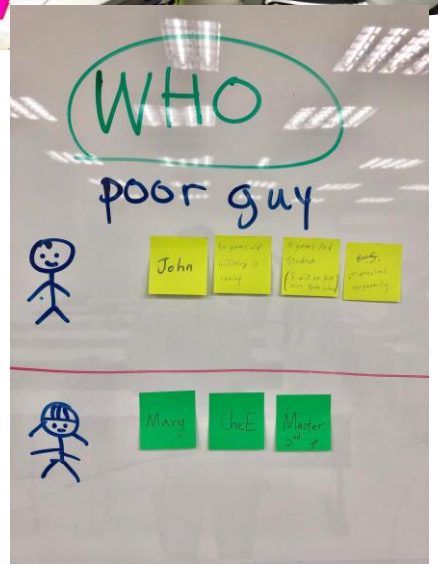
From challenges to opportunities:

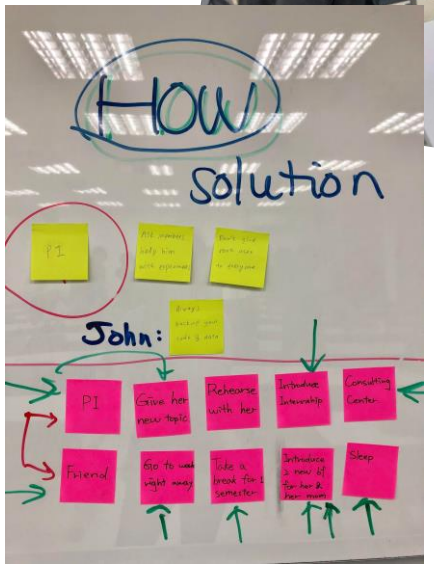
Toward better ERPP practices through the lens of Activity Theory

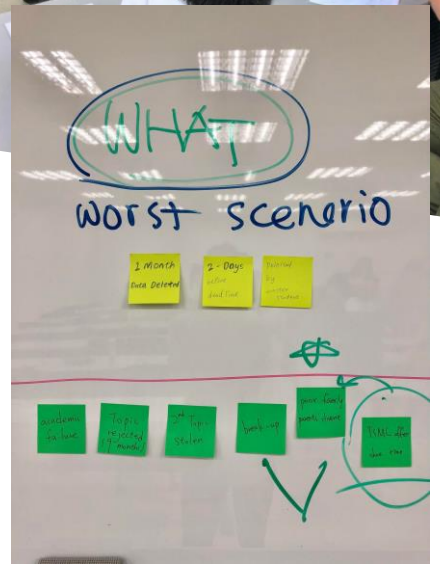
科技論文教學實踐的挑戰與轉機：整合電腦輔助與協 同教學之創新模式（ 107）

Path 2 Integrity









Don’ ts → Dos

Academic Misconduct

Learn the rules so you don’t accidentally break them

https://unilife.southwales.ac.uk/features/877-academic-misconduct?locale=en

Food for thought

- Good people, good research.
- Honesty is the best policy.
- Publications, for what?
- Research writing, for what?
- Publication = research writing?

Research misconducts: FFP

- **Fabrication**: The creation of non-existent data and results and the act of recording and reporting them.
- **Falsification**: The manipulation of research materials, equipment or processes or omitting data and results so that the research is not accurately represented in the research record.
- **Plagiarism**: The appropriation of another person's ideas, processes, results or words without giving the appropriate credit.

Stop saying NO!

Defining Research Misconduct: The definition of research misconduct as outlined by the ORI (ORI, 2019). Fabrication, falsification and plagiarism are the core tenets of their definition. Source publication

Good people

Photo credits: https://shortest.link/1tlD; https://shortest.link/1xlj ;https://shortest.link/1tlA; https://shortest.link/1tlB; https://shortest.link/1tlC; https://shortest.link/1xln;

Good research

https://www.donotedit.com/how-to-find-a-good-research-topic/;
https://www.istockphoto.com/illustrations/superwoman

Steneck, N. H., & United States. (2007). *ORI introduction to the responsible conduct of research*. Rockville, Md.: Dept. of Health and Human Services.

Fourth retraction for Haruko Obokata, focus of STAP cell scandal, after Harvard investigation

More than five years after Nature retracted two highly suspect papers about what had been described as a major breakthrough in stem cell research, another journal has pulled a paper about the work. The scandal over so-called STAP stem cells took down more than just a few articles.

https://retractionwatch.com/

Prominent researcher dismissed following misconduct probe

The University of Tokyo has fired a high-profile cell biologist after a probe determined his group had falsified data.

Yoshinori Watanabe

According to a news release issued today (in Japanese), the university has issued a "disciplinary dismissal" of Yoshinori Watanabe (according to our Google translate of the notice).

In 2016, the institution began an investigation of seven papers from Watanabe's lab after receiving anonymous allegations. In August 2017, the university announced the result: Five papers contained falsified or fabricated images. One — a 2015 *Science* paper — has already been retracted.

Journals stamp expressions of concern on 15 papers from Anversa's cardiac stem cell lab

More than four and a half years after questions were first raised abo work in a cardiac stem cell lab at Harvard and the Brigham and Women's Hospital, a year and a half after the Brigham and Partners Healthcare paid $10 million to settle allegations of fraud in the lab's

https://retractionwatch.com/

How did all these happen?

- Research **dis**honesty → cheating
- Research misconducts (FFP)
  - Fabrication
  - Falsification
  - Plagiarism

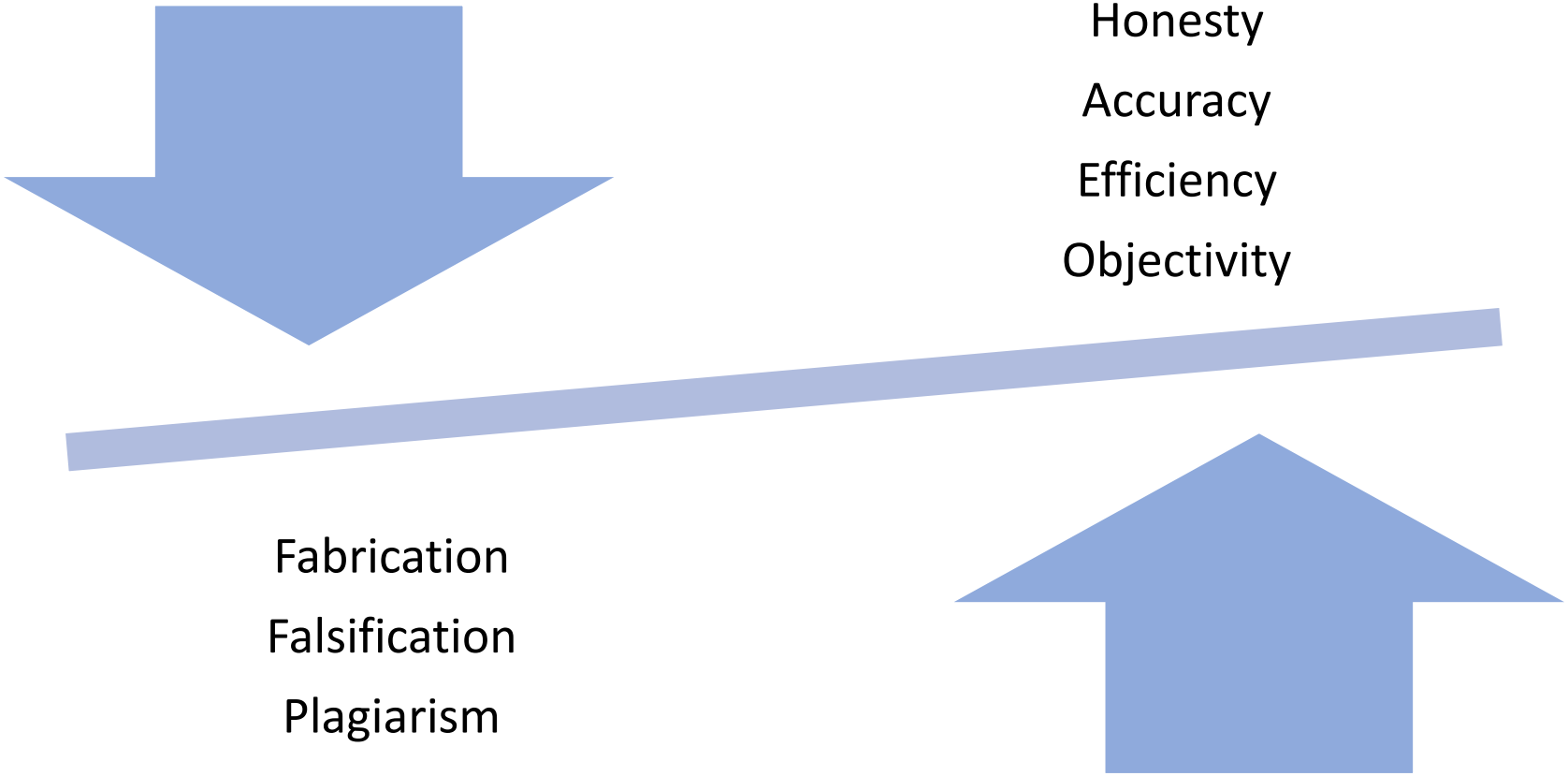
Paper retraction

✘ Honesty, ✘ Accuracy,

✘ Efficiency, ✘ Objectivity

https://www.research.uky.edu/research-misconduct;

Shared values v.s. research misconducts



Paper retraction, no funding, no job……

https://www.goldbio.com/articles/article/Publishing-Failure-in-Science; https://stock.adobe.com/tw/images/young-women-scientists-doctors-stress-and-discouragement-scientific-research-failed-professional-scientists-perform-experiments-while-laboratory-equipment-microscope-slide-failed-laboratory-conce/257359624 ; https://www.natureindex.com/news-blog/how-to-deal-with-failure-rejection-academic-research-say-senior-scientists

Responsible conduct of research (RCR) & Shared values

Steneck, N. H., & United States. (2007). *ORI introduction to the responsible conduct of research*. Rockville, Md.: Dept. of Health and Human Services.

The European Code of Conduct for Research Integrity

REVISED EDITION

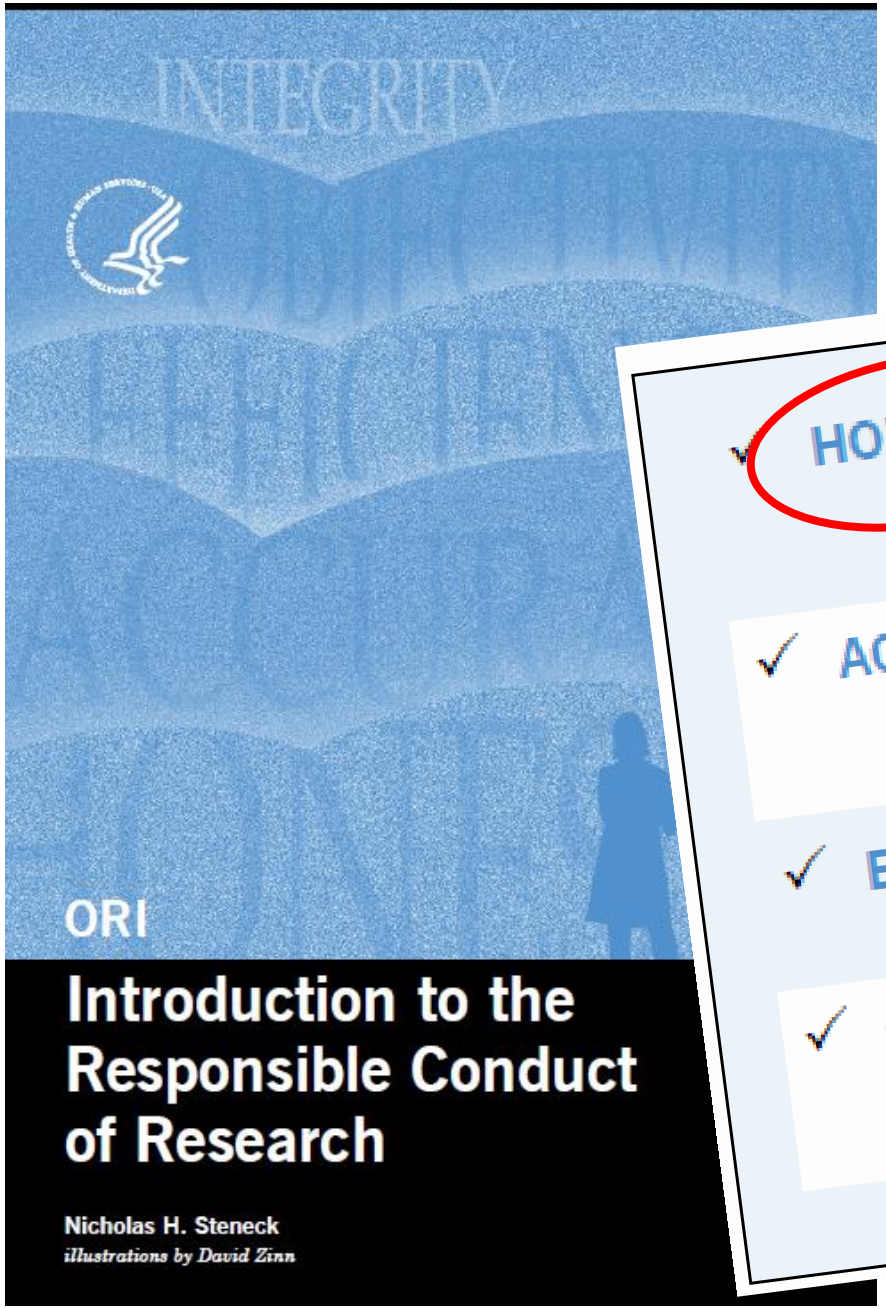
These principles are:

- **Reliability** in ensuring the quality of research, reflected in the design, the methodology, the analysis and the use of resources.

- **Honesty** in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way.

- **Respect** for colleagues, research participants, society, ecosystems, cultural heritage and the environment.

- **Accountability** for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts.



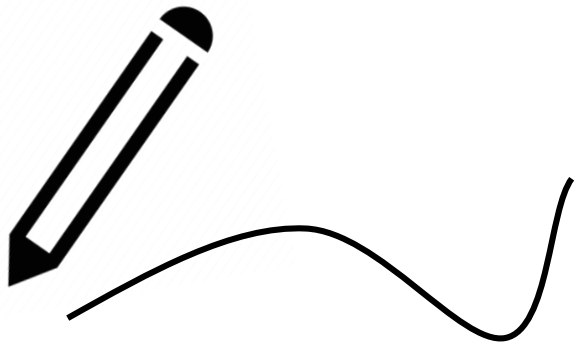
- ✓ **HONESTY** — conveying information truthfully and honoring commitments,
- ✓ **ACCURACY** — reporting findings precisely and taking care to avoid errors,
- ✓ **EFFICIENCY** — using resources wisely and avoiding waste, and
- ✓ **OBJECTIVITY** — letting the facts speak for themselves and avoiding improper bias.

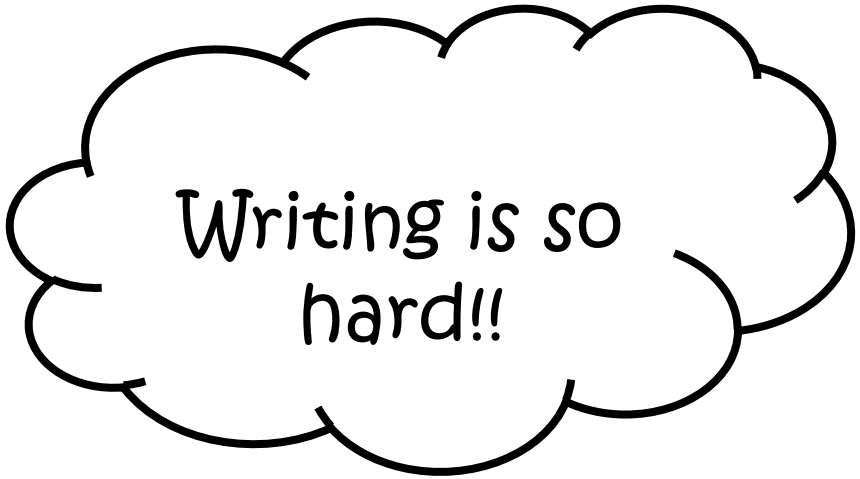
- Research writing is evidence-based. → **Accuracy & Objectivity**
- You say what you can prove; you say what's from you. → **Honesty**


Values & beliefs
Conduct & behaviors
Consequences
Honesty
Good research writing
A healthy scientific community

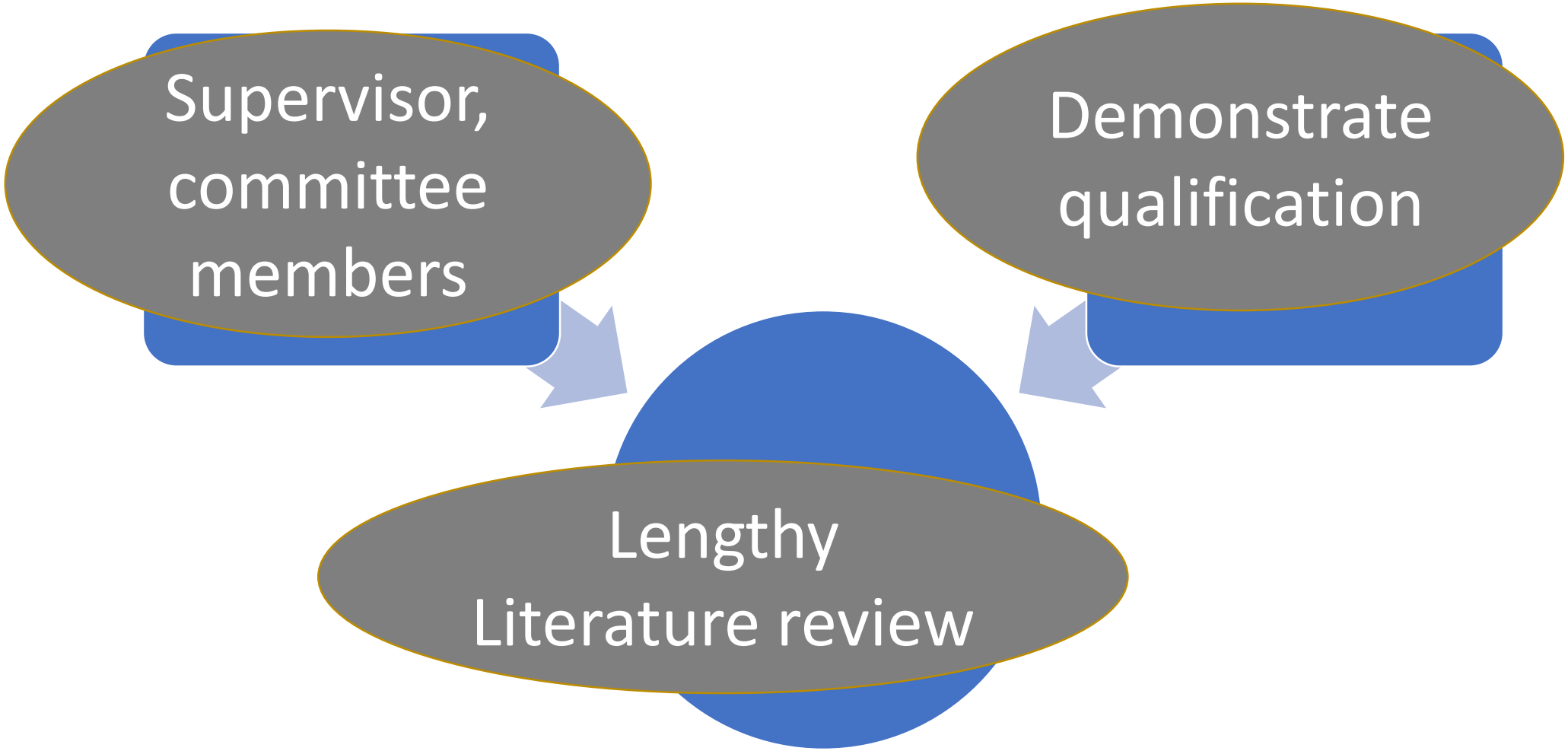
Why research *writing* ?

- What is the purpose of research writing?
- Effective writing involves considerations.
  - Audience, language use…

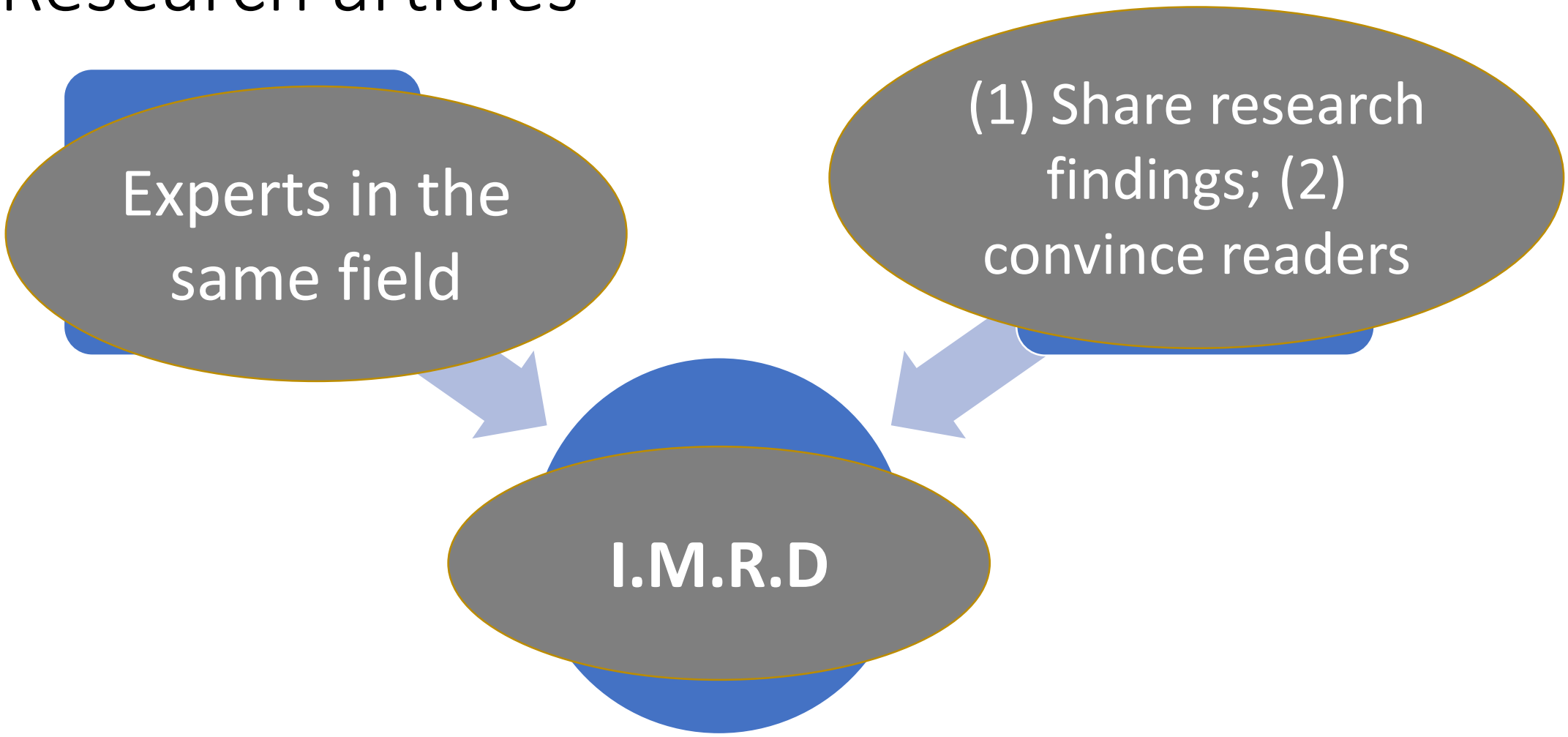




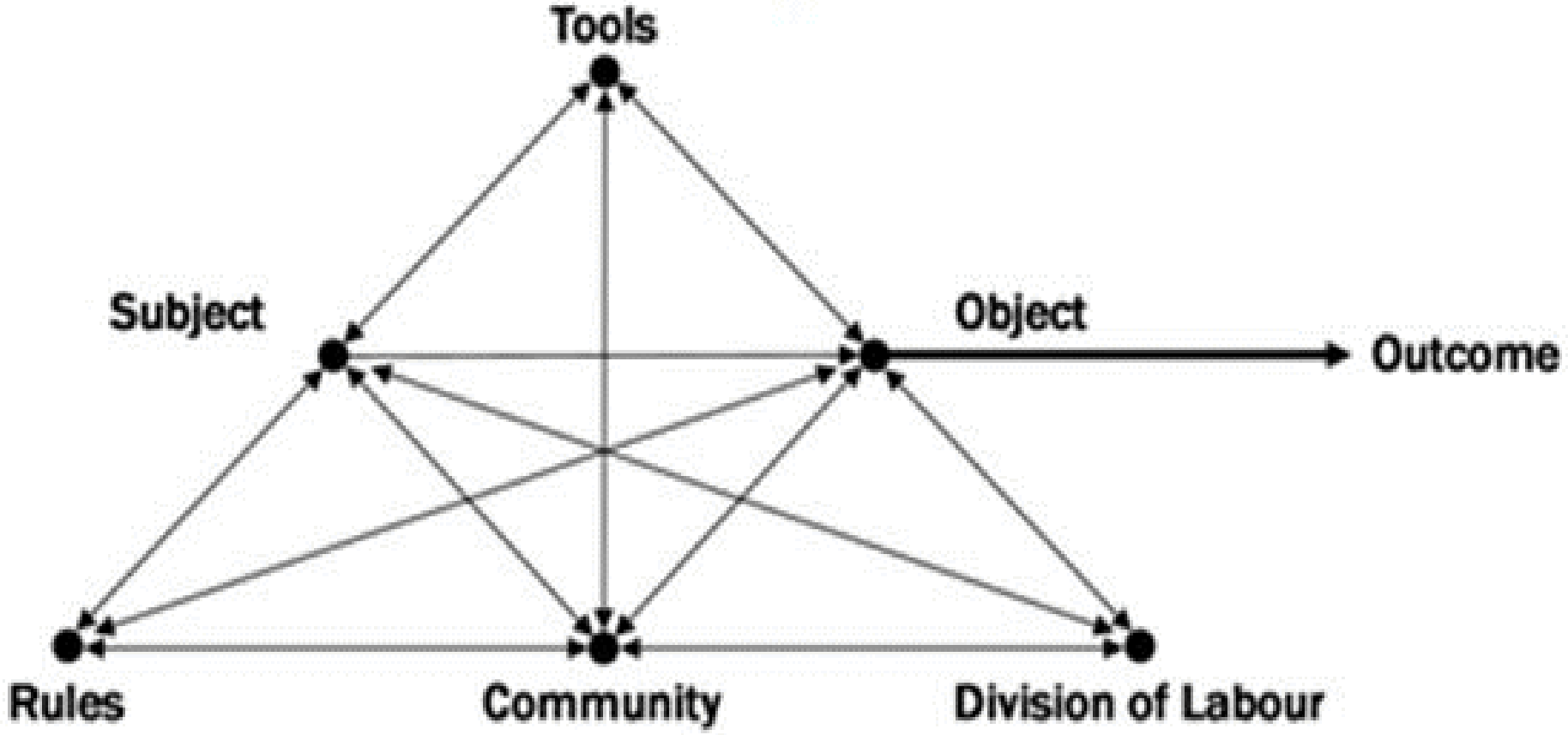
Degree thesis/dissertation



Research articles

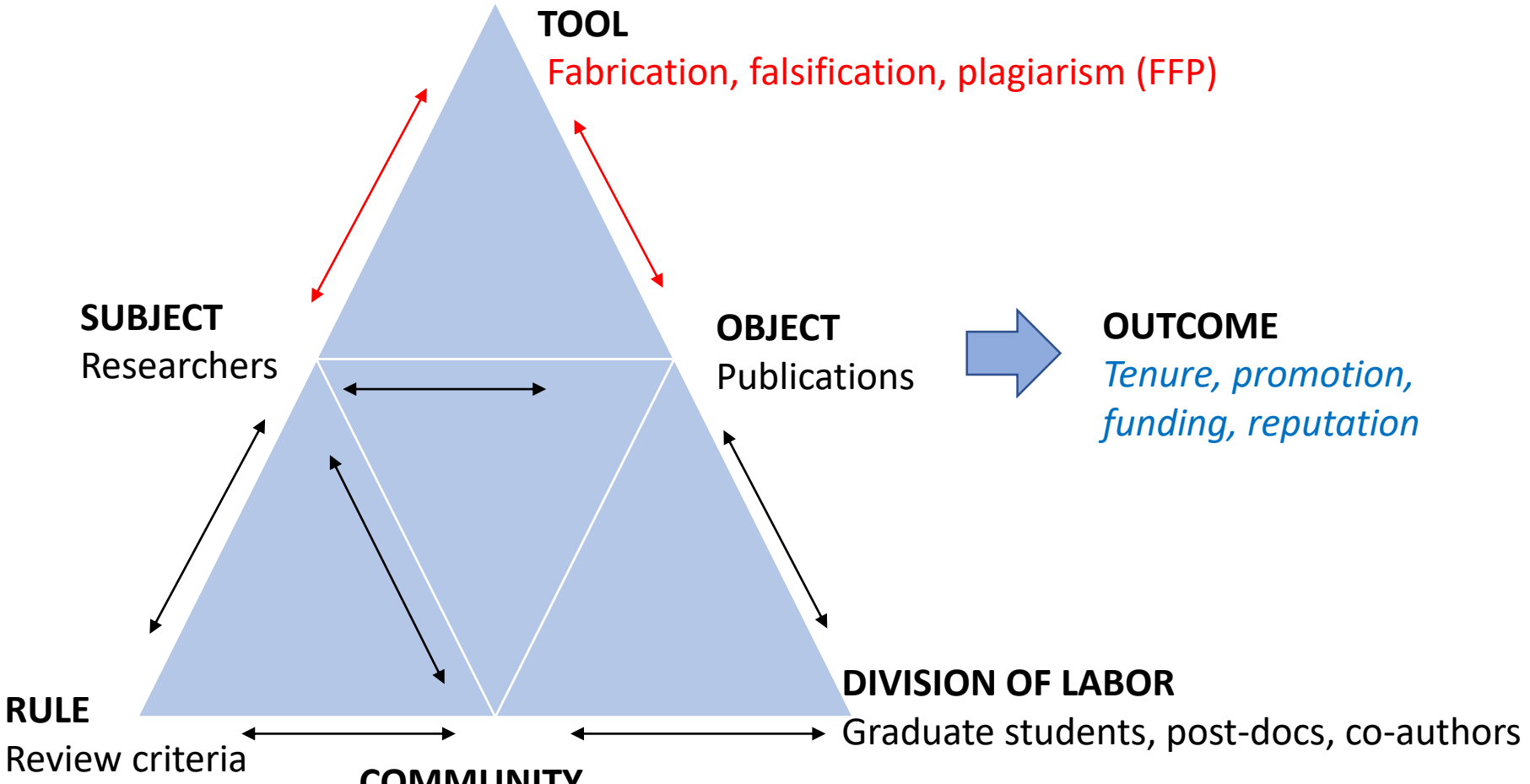


Publication? Research writing?

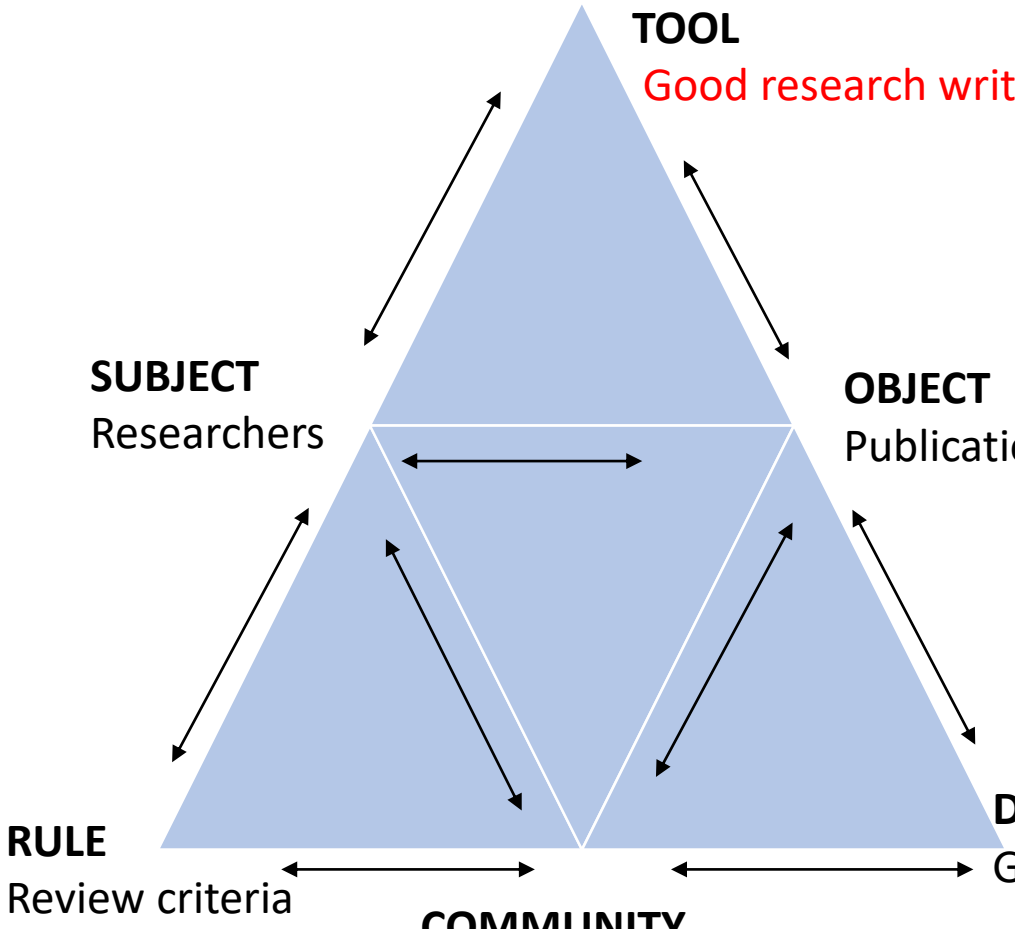


Activity theory (AT) model (Engeström, 1987, p.78)

Academia as an industry



Academia as a community with shared values



TOOL
Good research writing!!

SUBJECT
Researchers

OBJECT
Publications

OUTCOME
Share findings, spread knowledge, build a better world

RULE
Review criteria

DIVISION OF LABOR
Graduate students, post-docs, co-authors

COMMUNITY
Peer reviewers, journal editors, peer experts, colleagues

Thesis vs research article: *For whom & for what*

Thesis

- Supervisor, committee members
  - What does the intended reader want to know?
- To demonstrate your knowledge
- To prove that you've put in sufficient efforts in training

→Lengthy

Research article

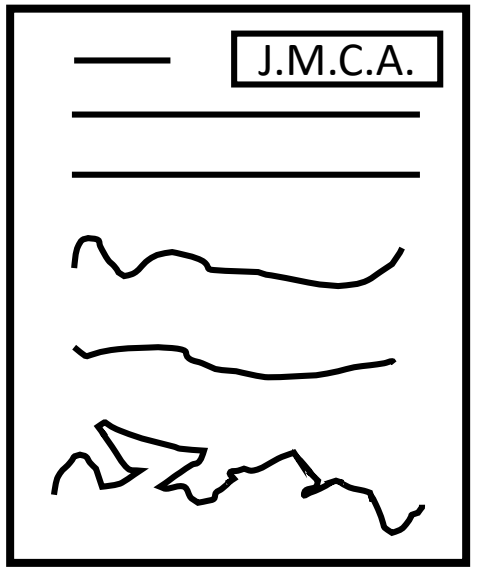
- Peer experts in the same field
  - What does the intended reader want to know?
- To share research findings
- To convince readers that your work is novel and significant

→Concise

Effective writing

- Writing is communication.
- Communication involves audience & purposes.
- What do we want to achieve through research writing (again)?
  - To report findings, to share knowledge.
  - To convince, to argue.
- Who are we sharing this information to?
  - Professionals in the same field, with or without background knowledge.

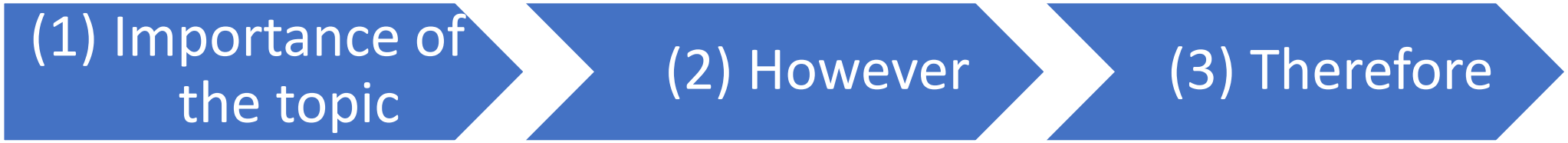
Thesis & RAs:
audience + purpose → organization



Research articles (RAs) as a genre

- IMRD structure accommodates the necessary information.

- CARS model includes the convincing communicative moves.



Create a Research Space (CARS)

- Universal pattern across disciplines
- Provide a convincing rationale of the research

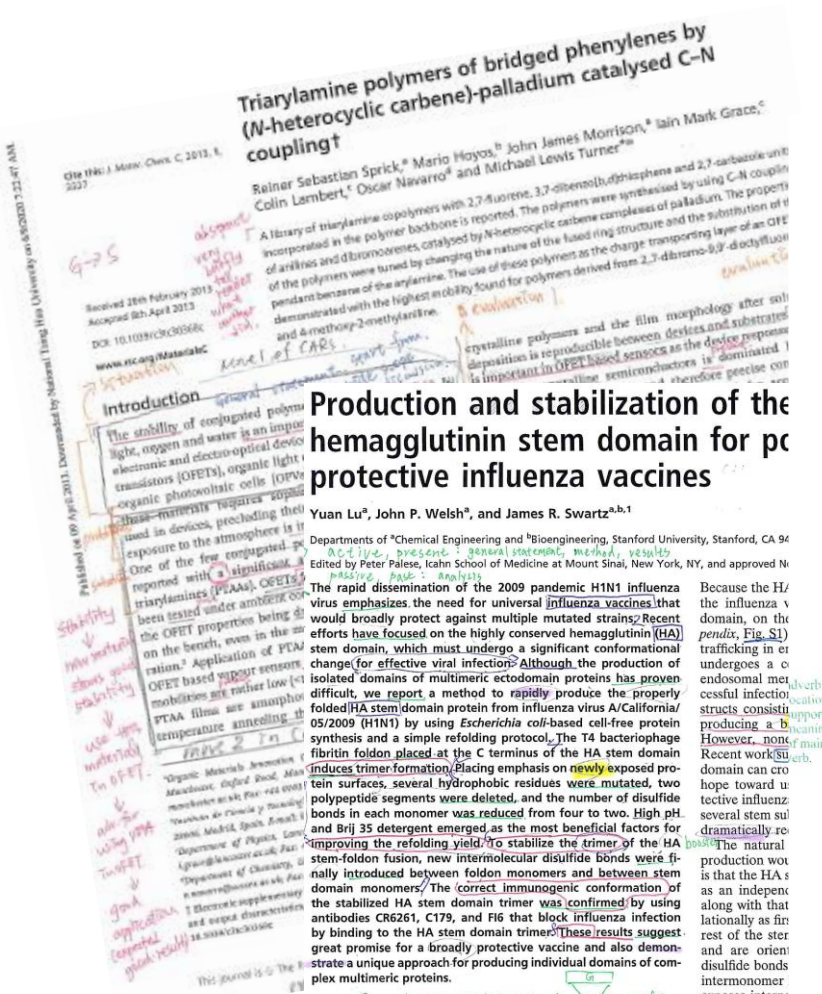
→Easy to follow & to understand the value of the research

- Include 3 logical moves

Move **1 –** Establishing a research territory **(background)**

Move **2 –** Establishing a niche **(however)**

Move **3 –** Occupying the niche**(therefore)**



Triarylamine polymers of bridged phenylenes by (*N*-heterocyclic carbene)-palladium catalysed C–N coupling†

Reiner Sebastian Sprick,[a] Mario Hoyos,[b] John James Morrison,[a] Iain Mark Grace,[c] Colin Lambert,[c] Oscar Navarro[a] and Michael Lewis Turner*[a]

Introduction

Production and stabilization of the hemagglutinin stem domain for pc protective influenza vaccines

Yuan Lu[a], John P. Welsh[a], and James R. Swartz[a,b,1]

Departments of [a]Chemical Engineering and [b]Bioengineering, Stanford University, Stanford, CA 94

Edited by Peter Palese, Icahn School of Medicine at Mount Sinai, New York, NY, and approved N

The rapid dissemination of the 2009 pandemic H1N1 influenza virus emphasizes the need for universal influenza vaccines that would broadly protect against multiple mutated strains. Recent efforts have focused on the highly conserved hemagglutinin (HA) stem domain, which must undergo a significant conformational change for effective viral infection. Although the production of isolated domains of multimeric ectodomain proteins has proven difficult, we report a method to rapidly produce the properly folded HA stem domain protein from influenza virus A/California/05/2009 (H1N1) by using *Escherichia coli*-based cell-free protein synthesis and a simple refolding protocol. The T4 bacteriophage fibritin foldon placed at the C terminus of the HA stem domain induces trimer formation. Placing emphasis on newly exposed protein surfaces, several hydrophobic residues were mutated, two polypeptide segments were deleted, and the number of disulfide bonds in each monomer was reduced from four to two. High pH and Brij 35 detergent emerged as the most beneficial factors for improving the refolding yield. To stabilize the trimer of the HA stem-foldon fusion, new intermolecular disulfide bonds were finally introduced between foldon monomers and between stem domain monomers. The correct immunogenic conformation of the stabilized HA stem domain trimer was confirmed by using antibodies CR6261, C179, and FI6 that block influenza infection by binding to the HA stem domain trimer. These results suggest great promise for a broadly protective vaccine and also demonstrate a unique approach for producing individual domains of complex multimeric proteins.

Vaccination is the most effective way to protect against influenza virus infection, with most of the neutralizing antibodies recognizing the hemagglutinin (HA) protein on the surface of the virus. As of 2007, all commercial influenza vaccines were produced in embryonated chicken eggs, but the generation of a new vaccine takes six to eight months, making it ineffective for combating potential pandemics (1). In 2007, to partially address this concern, the European Union approved Optaflu, a vaccine produced by Novartis using a mammalian cell line (2). In 2013, the recombinant HA vaccine (Flublok) manufactured in insect cells by Protein Sciences was also licensed in the United States (3). However, the new processes would still likely only improve production times by several weeks (4). Hence, rapid production (for example in 1–2 mo) of large amounts of vaccine to stop an epidemic/pandemic remains an important objective. This challenge can be addressed in two ways, either by producing a more broadly protective vaccine to lower the probability of a pandemic occurrance or by developing new, rapid, and scalable technologies for vaccine production.

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main would be an ideal antigen. However, its productio

proven extremely difficult. Here, we describe a simple procedure resulting in high yields of HA stem trimer recognized identically by a panel of neutralizing antibodies as compared with recognition of the full-length HA ectodomain. Cell-free protein synthesis is followed by a simple refolding procedure to produce a rationally mutated stem in which newly exposed protein surfaces are modified and trimerization is induced and covalently stabilized.

Ruthenium doped mesoporous titanium dioxide for highly efficient, hysteresis-free and stable perovskite solar cells

Rohit D. Chavan[a], Pankaj Yadav[b], Ajaysing Nimbalkar[a], Sangram P. Bhoite[a], Popatrao N. Bhosale[c], Chang Kook Hong[b,*]

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ARTICLE INFO

Keywords:
Perovskite solar cells
Mesoporous-TiO_2
Electronic and photovoltaic properties
Doping
Hysteresis index
Stability

1. Introduction

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Predictive Hot-
of n-Channe

Markus Bina, Stanislav Tyaginov, Jacopo Franco,
Ben Kaczer, and Tibor Gras

Abstract— We present a physics-based hot-carrier degradation (HCD) model and validate it against measurement data on SiON n-channel MOSFETs of various channel lengths, from ultra-scaled to long-channel transistors. The HCD model is capable of representing different conditions using a unique set of model parameters. The degradation is modeled as a dissociation of Si–H bonds induced by two competing processes. It can be triggered by solitary highly energetical charge carriers or by excitation of multiple vibrational modes of the bond. In addition, we show that the influence of electron–electron scattering (EES), the dipole-field interaction, and the dispersion of the Si–H bond energy are crucial for understanding and modeling HCD. All model ingredients are considered on the basis of a deterministic Boltzmann transport equation solver, which serves as the transport kernel of a physics-based HCD model. Using this model, we analyze the role of each ingredient and show that EES may only be neglected in long-channel transistors, but is essential in ultrascaled devices.

Index Terms—Degradation, hot-carrier, interface trap, MOSFET, reliability, spherical harmonics, spherical harmonics expansion (SHE), ViennaSHE.

I. Introduction

HOT-CARRIER degradation (HCD) has been known as a detrimental phenomenon for more than four decades as it impacts the performance of the fundamental building block of modern microelectronics, the MOS transistor. During the last four decades, HCD models have evolved from empirical or phenomenological approaches [1]–[3] to more complex models in an attempt to reveal the rich physics behind this effect [4]–[6]. The early attempts aimed at linking the device life time to macroscopic quantities, such as the electric field,

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S. Tyaginov is with the Institute for Microelectronics, Technische Universität Wien, Wien 1040, Austria, and also with the Ioffe Physical-Technical

CrystEngComm

PAPER

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From α-$NaMnO_2$ to crystal water containing Na-birnessite: enhanced cycling stability for sodium-ion batteries†

Yanyang Li,[a] Xiangming Feng,[a] Shizhong Cui,[b] Qiuzhi Shi,[a] Liwei Mi*[ab] and Weihua Chen*[a]

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DOI: 10.1039/c6ce00191b

www.rsc.org/crystengcomm

In this work, α-$NaMnO_2$ has been synthesized first. And then, after reacting with water, α-$NaMnO_2$ translates into crystal water containing Na-birnessite with a large interlayer distance of 7.15 Å. The synthesized α-$NaMnO_2$ exhibits a discharge capacity (126.4 mA h g^{-1}) higher than that of the crystal water containing Na-birnessite (100.9 mA h g^{-1}). However, the crystal water containing Na-birnessite exhibits a cycling stability higher than α-$NaMnO_2$ owing to the larger interlayer distance of Na-birnessite with the crystal water in the interlayer. Therefore, an effective way to improve the cycling stability of this kind of material is by changing the interlayer distance.

Introduction

Lithium-ion batteries have received wide attention in mitigating the energy crisis and environmental pollution.[1,2] However, the high cost and limited reserves of this material on earth hinder further large-scale applications. Therefore, the interest on sodium-ion batteries has been revived considering the abundance of sodium on earth.[3–5] Compared with Li^+, Na^+ exhibits a larger ion radius (0.102 nm for Na^+ *vs.* 0.076 nm for Li^+) and higher electrode potential (−2.71 V for Na^+/Na *vs.* −3.04 V for Li^+/Li).[5] The large ion radius and high electrode potential can reduce the rate of performance and power density of sodium-ion batteries. Therefore, new materials with high electrochemical performance should be explored. Various cathode materials in sodium-ion batteries have been studied, such as Na_xMO_2 ($0.0 \le x \le 1$, M = Ti, Cr, Mn, Fe, and Co),[3,6–11] $NaMPO_4$ (M = V, Mn, and Fe),[12–14] and $Na_xM_1M_2(CN)_6$ (M_1 = Mn, Fe, Co, and Ni; M_2 = Fe and Mn).[15] Layered Na_xMnO_2-based materials ($0.2 < x \le 1$) demonstrate superior specific capacities.[16] Among these materials, α-$NaMnO_2$ exhibits an O′3 layered structure, which is transformed from the O3 crystal structure of common $LiCoO_2$.[17–19] For α-$NaMnO_2$, on the one hand, 0.80 Na can be deintercalated reversibly in an organic sodium-ion batteries.[19] On the other hand, α-$NaMnO_2$ has also been used in aqueous energy storage devices.[20,21] However, α-$NaMnO_2$ would translate into Na-birnessite when in contact with water,[22,23] therefore, the electrochemical performances of α-$NaMnO_2$ in aqueous energy storage devices are provided by birnessite.

Birnessite is a common manganese oxide that can be used as a scavenger for heavy metals, photocatalytic materials, and ion exchange materials.[24,25] The crystalline quality, intercalated alkaline cation, and crystal water content of birnessite can largely influence its properties.[25] Birnessite is also a promising material for Li, Na, and Mg storage. Moreover, the crystal water in birnessite can promote the storage of Na^+ and Mg^{2+}.[26–28] The electrochemical performances of Na-birnessite synthesized by the oxidation method in organic/aqueous sodium-ion batteries have been reported.[26,27] However, the Na-birnessite in previous reports[26,27] have poor crystallinity. Here, the Na-birnessite with higher crystallinity has been synthesized in a different method and tested in organic sodium-ion batteries.

In this study, the synthesis processes and electrochemical performance of α-$NaMnO_2$ and Na-birnessite translated from α-$NaMnO_2$ are explored. With a simple water effect, α-$NaMnO_2$ transforms into well-crystallized Na-birnessite. Compared with the Na-birnessite synthesized by the oxidation method, the Na-birnessite synthesized in this work has a different chemical composition and higher crystallinity. The well-crystallized crystal water containing Na-birnessite transformed from α-$NaMnO_2$ was adopted as a cathode for organic sodium-ion batteries. Na-birnessite exhibits a cycling stability higher than α-$NaMnO_2$. The enhanced cycling stability can be attributed to the larger interlayer distance of Na-birnessite and the existence of crystal water in the interlayer.

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† Electronic supplementary information (ESI) available. See DOI: 10.1039/c6ce00191b

Reading *for* writing

- Data-driven and literacy-oriented approach
  - To improve research writing skills
- Deconstructing research articles
  - Organization
  - Structure → Increase genre awareness
  - Language use and *re*use → Develop individual corpus

SCIENTIFIC REPORTS

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Characterization of nanoscale temperature fields during electromigration of nanowires

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Quantitative studies of nanoscale heat dissipation (Joule heating) are essential for advancing nano-science and technology. Joule heating is widely expected to play a critical role in accelerating electromigration induced device failure. However, limitations in quantitatively probing temperature fields—with nanoscale resolution—have hindered elucidation of the role of Joule heating in electromigration. In this work, we use ultra-high vacuum scanning thermal microscopy to directly quantify thermal fields in nanowires during electromigration. Our results unambiguously illustrate that electromigration begins at temperatures significantly lower than the melting temperature of gold. Further, we show that during electromigration voids predominantly accumulate at the cathode resulting in both local hot spot and asymmetric temperature distributions. These results provide novel insights into the microscopic details of hot spot evolution during electromigration and are expected to guide the design of reliable nanoscale functional devices.

Understanding heat dissipation (Joule heating) and transport in nanoscale devices is critical for realizing novel nanoscale functional devices. In fact, Joule heating is widely expected to play an important role in electromigration induced device failure, a process where atoms in a device are displaced due to momentum transfer between charge carriers and the lattice[1–3]. Electromigration in devices is always accompanied by Joule heating, which accelerates the electromigration process by affecting the mobility of atoms and is well known to limit the operating voltages and the reliability of functional devices[3,4–5]. Further, electromigration has also been utilized recently to create novel nanoscale electronic and memory devices[16–19]. To better understand the role of Joule heating on electromigration several research groups have indirectly estimated the local temperature changes during electromigration[3–10,12–15]. However, direct quantification of temperature fields during electromigration—with nanoscale resolution—has remained elusive although such knowledge is critical for both increasing the reliability of nanoscale devices and creating functional devices that take advantage of electromigration.

In this work, we leverage recent advances in ultra-high vacuum scanning thermal microscopy (UHV-SThM)[21,22] that enable quantitative nanoscale measurements of temperature fields. Using this technique, we probe temperature fields in prototypical bow-tie shaped gold (Au) devices (see Fig. 1a or 3a) that are widely used in molecular electronics for creating electromigrated break junction based molecular-scale devices[17,18,23,24] and in plasmonics for obtaining local enhancements in electric fields[25,26]. To elaborate, temperature measurements are performed (in the contact mode) using a custom fabricated scanning probe with an integrated thermocouple in two different schemes: (a) an unmodulated scheme (DC scheme) where the temperature field is not periodically modulated and (b) a modulated scheme (AC scheme) where the temperature field is periodically modulated at a frequency of 10 Hz. The DC scheme enables fast thermal measurements while achieving a somewhat lower temperature resolution (~2 K). Whereas, the AC scheme requires a relatively longer time (~85 minutes) to map the temperature fields but enables higher spatial (~10 nm) and temperature (~15 mK) resolutions, see Supplementary Information (SI) for more details. By employing these two schemes we performed experiments to obtain detailed information regarding both the temperature rise of local hot spots (where electromigration is initiated) and the spatial variations of temperature fields in nanoscale devices during electromigration.

Results

The schematic of the experimental setup is shown in Fig. 1a. The bow-tie shaped Au nanowires (~225 nm wide and ~450 nm long) were defined by e-beam lithography and evaporation (Ti/Au, 3/40 nm thick) on a Si wafer

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SCIENTIFIC REPORTS

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Distinct Top-down and Bottom-up Brain Connectivity During Visual Perception and Imagery

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Research suggests that perception and imagination engage neuronal representations in the same visual areas. However, the underlying mechanisms that differentiate sensory perception from imagination remain unclear. Here, we examine the directed coupling (effective connectivity) between fronto-parietal and visual areas during perception and imagery. We found an increase in bottom-up coupling during perception relative to baseline and an increase in top-down coupling during both perception and imagery, with a much stronger increase during imagery. Modulation of the coupling from frontal to early visual areas was common to both perception and imagery. Furthermore, we show that the experienced vividness during imagery was selectively associated with increases in top-down connectivity to early visual cortex. These results highlight the importance of top-down processing in internally as well as externally driven visual experience.

Visual experience can be caused by external events in the outside world, like the appearance of an object, or by internal signals generating visual images in our mind's eye. Localisation of the neural structures that represent the content of visual imagery is an important step in the process of understanding the underlying mechanisms that generate visual images[1]. In 1980, Kosslyn proposed that imagery uses the same 'visual buffer' as perception to represent visual content. In line with this idea, neuroimaging has shown that visual areas have similar neural representations of imagined and perceived objects, with higher overlap in late visual areas[1–3]. The overlap in early visual areas depends on the exact imagery task[1,3] and the experienced vividness of the imagery[4–7].

Developing a detailed understanding of the mechanisms by which our brains generate visual experience calls for the elucidation of dynamic top-down and bottom-up connectivity within and between the neural structures involved[8,9]. Whereas during perception, activation of visual representations is ultimately caused by bottom-up influences from the retina, these exogenous influences are absent during visual imagery. How visual areas are activated in the absence of stimulus bound, bottom-up input, remains an open question. Recent work using measures of effective (directed) connectivity during imagery suggests that top-down projections from fronto-parietal areas to visual areas are involved in visual imagery[10,11].

There is a large body of research showing that top-down influences also play an important role in perception[12–14]. The predictive coding account of perception proposes that visual experience is a product of the reciprocal exchange of bottom-up and top-down influences throughout the neuronal hierarchy[15,16]. From this perspective, the question arises to what extent recurrent exchange differs during perception and imagery. Here, we investigated this aspect of distributed neuronal processing by examining how effective connectivity changes during these two forms of visual experience.

We hypothesized distinct context sensitive patterns of top-down and bottom-up influences during imagery compared to perception. We used dynamic causal modelling (DCM) to characterise the effective connectivity that best explains the BOLD (Blood Oxygen Level Dependent) response during visual perception and imagery. Based on hierarchical predictive coding, we hypothesized an increase in bottom-up coupling, relative to baseline, during perception but not imagination and an increase in top-down coupling during visual experience; i.e., both perception and imagery.

Materials and Methods

Subjects. Twenty-nine healthy adult volunteers with normal or corrected to normal vision gave written informed consent and participated in the experiment. An initial analysis of these data is already published in

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Recently, More recently, In recent years,	there has been	growing interest in … renewed interest in … a surge of interest in … extensive research on … increased emphasis on … an increasing interest in … growing recognition of the vital links between … a growing number of publications focusing on … a greater focus placed upon X within the Y literature. world-wide recognition of the problems associated with …

X	has been	studied widely studied extensively an object of research studied using light-microscopy attracting considerable interest	since	the 1960s. it was discovered in 1981. the early years of this century.

https://www.phrasebank.manchester.ac.uk/

(However,)	the study the paper	suffers from	inconsistent definitions. poorly developed theory. historical and cultural bias. methodological limitations. serious sampling problems. a lack of clarity in defining ... inadequate research design. considerable design limitations. the use of poorly matched controls. a paucity of standardised measures. notable methodological weaknesses. fundamental flaws in research design. lack of a strong theoretical framework. certain ambiguities at the conceptual level. an over-reliance on self-report methodology. a restricted range of methodological approaches. shortcomings in the methods used to select cases. a lack of well-grounded theoretical considerations. several conceptual and methodological weaknesses.

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Most studies of X	have only focused on ... are unsatisfactory because they ... fail to estimate economic rates of ... have only investigated the impact of ... have not included variables relating to ... are limited by weak designs and a failure to address ... have only been carried out in a small number of areas.

So far, To date, Up to now,	there	has been no systematic analysis of ... have been no attempts to examine ... has been very little research directly investigating X. have been very few empirically published accounts of X.
	(very) little	research has been carried out on ... has been published on the subject of ... attention has been paid to the role of ... research has addressed the question of ...
	(very) few	studies have assessed the role of ... studies have examined the association between ... studies have investigated x in any systematic way ... randomised clinical trials have specifically investigated x in ...

The (primary) aim of this paper is to	explore the … trace the history of … assess the claim that … review recent research into the … explore the relationship between … contribute to the understanding of … provide empirical evidence for the claim that … propose a conceptual theoretical framework based on …

The aim of this paper is to	critically	analyse the effects of … examine the claim that … review the evidence for … examine the ways in which … review the different approaches used to … evaluate the rationale behind X's theory of … discuss the some of the prominent ideas which …

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Identify the components in the abstract: background, aim/objective, method, results.

> Chem Sci. 2015 Apr 1;6(4):2608-2613. doi: 10.1039/c5sc00648a. Epub 2015 Feb 25.

A mechanically interlocked molecular system programmed for the delivery of an anticancer drug

Romain Barat [1], Thibaut Legigan [1], Isabelle Tranoy-Opalinski [1], Brigitte Renoux [1], Elodie Péraudeau [2 3], Jonathan Clarhaut [1 3], Pauline Poinot [4], Antony E Fernandes [5], Vincent Aucagne [6], David A Leigh [7], Sébastien Papot [1]

Affiliations + expand

PMID: 29308165 PMCID: PMC5649224 DOI: 10.1039/c5sc00648a

Free PMC article

Abstract

The development of mechanically interlocked molecular systems programmed to operate autonomously in biological environments is an emerging field of research with potential medicinal applications. Within this framework, functional rotaxane- and pseudorotaxane-based architectures are starting to attract interest for the delivery of anticancer drugs, with the ultimate goal to improve the efficiency of cancer chemotherapy. Here, we report an enzyme-sensitive [2]-rotaxane designed to release a potent anticancer drug within tumor cells. The molecular device includes a protective ring that prevents the premature liberation of the drug in plasma. However, once located inside cancer cells the [2]-rotaxane leads to the release of the drug through the controlled disassembly of the mechanically interlocked components, in response to a determined sequence of two distinct enzymatic activations. Furthermore, *in vitro* biological evaluations reveal that this biocompatible functional system exhibits a noticeable level of selectivity for cancer cells overexpressing β-galactosidase.

A mechanically interlocked molecular system programmed for the delivery of an anticancer drug	Move
(1) The development of mechanically interlocked molecular systems programmed to operate autonomously in biological environments is an emerging field of research with potential medicinal applications.	Background - General
(2) Within this framework, functional rotazane- and pseudorotaxane-based architectures are starting to attract interest for the delivery of anticancer drugs, with the ultimate goal to improve the efficiency of cancer chemotherapy.	Background – specific
(3)Here, we report an enzyme-sensitive – [2]-rotaxane designed to release a potent anticancer drug within tumor cells.	Objective
(4)The molecular device includes a protective ring that prevents the premature liberation of the drug in plasma.	Method
(5) However, once located inside cancer cells the [2]-rotaxane leads to the release of the drug through the controlled disassembly of the mechanically interlocked components, in response to a determined sequence of two distinct enzymatic activations.	Findings
(6) Furthermore, in vitro biological evaluations reveal that this biocompatible unctional system exhibits a noticeable level of selectivity for cancer cells overexpressing β-galactosidase.	Conclusion

A mechanically interlocked molecular system programmed for the delivery of an anticancer drug	Move
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Abstract— We present a physics-based hot-carrier degradation (HCD) model and validate it against measurement data on SiON n-channel MOSFETs of various channel lengths, from ultra-scaled to long-channel transistors. The HCD model is capable of representing HCD in all these transistors stressed under different conditions using a unique set of model parameters. The degradation is modeled as a dissociation of Si–H bonds induced by two competing processes. It can be triggered by solitary highly energetical charge carriers or by excitation of multiple vibrational modes of the bond. In addition, we show that the influence of electron–electron scattering (EES), the dipole-field interaction, and the dispersion of the Si–H bond energy are crucial for understanding and modeling HCD. All model ingredients are considered on the basis of a deterministic Boltzmann transport equation solver, which serves as the transport kernel of a physics-based HCD model. Using this model, we analyze the role of each ingredient and show that EES may only be neglected in long-channel transistors, but is essential in ultrascaled devices.

5 moves and verb tenses in the Abstract

Move	Tense
Background (G-S)	**Present**/present perfect tense
Objective/ Principal activity	**Present**/past tense
Methodology/ Methods	**Present**/past tense
Results/ Findings	**Present**/past tense
Conclusions	**Present** tense/tentative verbs modal auxiliaries

Source: Weissberg, R. & Buker, S. (1990). Writing Up Research: Experimental Research Report Writing for Students of English. Pearson Education.

Nerve injury drives a heightened state of vigilance and neuropathic sensitization in *Drosophila*

Thang M. Khuong[1], Qiao-Ping Wang[1,2], John Manion[1], Lisa J. Oyston[1], Man-Tat Lau[1], Harry Towler[1], Yong Qi Lin[1], G. Gregory Neely[1,3]*

Injury can lead to devastating and often untreatable chronic pain. While acute pain perception (nociception) evolved more than 500 million years ago, virtually nothing is known about the molecular origin of chronic pain. Here we provide the first evidence that nerve injury leads to chronic neuropathic sensitization in insects. Mechanistically, peripheral nerve injury triggers a loss of central inhibition that drives escape circuit plasticity and neuropathic allodynia. At the molecular level, excitotoxic signaling within GABAergic (γ-aminobutyric acid) neurons required the acetylcholine receptor *nAChRα1* and led to caspase-dependent death of GABAergic neurons. Conversely, disruption of GABA signaling was sufficient to trigger allodynia without injury. Last, we identified the conserved transcription factor twist as a critical downstream regulator driving GABAergic cell death and neuropathic allodynia. Together, we define how injury leads to allodynia in insects, and describe a primordial precursor to neuropathic pain may have been advantageous, protecting animals after serious injury.

Injury can lead to devastating and often untreatable chronic pain. While acute pain perception (nociception) evolved more than 500 million years ago, virtually nothing is known about the molecular origin of chronic pain. Here we provide the first evidence that nerve injury leads to chronic neuropathic sensitization in insects. Mechanistically, peripheral nerve injury triggers a loss of central inhibition that drives escape circuit plasticity and neuropathic allodynia. At the molecular level, excitotoxic signaling within GABAergic (γ-aminobutyric acid) neurons required the acetylcholine receptor *nAChRα1* and led to caspase-dependent death of GABAergic neurons. Conversely, disruption of GABA signaling was sufficient to trigger allodynia without injury. Last, we identified the conserved transcription factor twist as a critical downstream regulator driving GABAergic cell death and neuropathic allodynia. Together, we define how injury leads to allodynia in insects, and describe a primordial precursor to neuropathic pain may have been advantageous, protecting animals after serious injury.

Developing a sampling plan by variables inspection for controlling lot fraction of defectives

Chien-Wei Wu [a,*], Shih-Wen Liu [b]

Acceptance sampling has been widely used tool for determining whether the submitted lot should be accepted or rejected. However, it cannot avoid two kinds of risks, accepting undesired poor product lots and rejecting good product lots. Such risks are even more significant as the rapid advancement of the manufacturing technology and stringent customers demand is enforced. A yield index S_{pk} has been developed to provide an exact measure on process yield or fraction nonconforming for normally distributed processes with two-sided specification limits. Therefore, the aim of this paper is to develop a variables sampling plan for evaluating the lot or process fraction nonconforming based on the yield index. The probability of lot acceptance is derived based on the sampling distribution and two-point condition on OC curve is used to determine the plan parameters. Tables of the plan parameters and step-by-step procedure are provided for the practitioner to make decision on lot sentencing especially for situations of products with very low fraction of nonconformities.

Abstract

Owing to capacity limit, yield demand, and cycle time reduction, determining proper strategy for the final testing of integrated circuits (IC) device is critical. Since none of the tests can perfectly distinguish good devices from bad, alternative testing strategies consisting of various setups and testing procedures affect the testing results and testing cycle time. However, this problem has seldom been addressed in literature. This study aims to construct a decision framework to analyze alternative testing strategies and thus derive the optimal strategy balancing operational efficiency, cost, and risk. This framework has been implemented in a semiconductor-testing firm in Taiwan. The results demonstrate practical viability of the proposed framework.

Keywords: Decision analysis; IC final test; Semiconductor manufacturing; Operational effectiveness; Manufacturing strategy

Abstract

Enhancing the robustness of functional biomacromolecules is a critical challenge in biotechnology, which if addressed would enhance their use in pharmaceuticals, chemical processing and biostorage. Here we report a novel method, inspired by natural biomineralization processes, which provides unprecedented protection of biomacromolecules by encapsulating them within a class of porous materials termed metal-organic frameworks. We show that proteins, enzymes and DNA rapidly induce the formation of protective metal-organic framework coatings under physiological conditions by concentrating the framework building blocks and facilitating crystallization around the biomacromolecules. The resulting biocomposite is stable under conditions that would normally decompose many biological macromolecules. For example, urease and horseradish peroxidase protected within a metal-organic framework shell are found to retain bioactivity after being treated at 80 °C and boiled in dimethylformamide (153 °C), respectively. This rapid, low-cost biomimetic mineralization process gives rise to new possibilities for the exploitation of biomacromolecules.

https://www.nature.com/articles/ncomms8240?origin=ppub

Abstract

Oral administration is a noninvasive and convenient drug delivery route most preferred by patients. However, poor stability in the gastrointestinal tract and low bioavailability of hydrophobic drugs has greatly limited their oral administration. To address this problem, we report a pH-responsive, amphiphilic hydrogel drug carrier based on a pseudopeptide poly(L-lysine isophthalamide) (PLP) and poly(ethylene glycol) (PEG). The hydrogels were prepared by a simple *N*-(3-(dimethylamino)propyl)-*N*′-ethyl carbodiimide hydrochloride (EDC)/*N*-hydroxysuccinimide (NHS) coupling reaction, and the cross-linking was confirmed by infrared spectroscopy and differential scanning calorimetry analyses. Because of the pH-responsive conformational alteration of PLP, the hydrogels were relatively hydrophobic and collapsed at acidic pH, but became hydrophilic and swollen at neutral pH. The amphiphilicity enabled the hydrogels to well retain and protect hydrophobic model drugs in the simulated gastric fluid, but efficiently release them in the simulated intestinal fluid. These results suggested that the pH-responsive amphiphilic hydrogels are promising candidates for oral delivery of hydrophobic drugs.

KEYWORDS: pH-responsive, hydrogel, oral delivery, pseudopeptide, poly(ethylene glycol), hydrophobic drug

https://pubs.acs.org/doi/abs/10.1021/acsbiomaterials.8b01040

Abstract

A novel separator of the polyethylene spin-coated electropsun polyimide (PE@PI) composite with multiple functions, including ideally thermo-dimensional stability, high electrolyte-uptake capability, good charge-discharge performance, and excellent thermal shutdown ability is designed for rechargeable lithium-ion batteries (LIBs). The uniform, sub-micrometer layer of spin-coated, low-density polyethylene provides the thermal shutdown function of this PE@PI separator without sacrificing its multi-functionality. This PE@PI film without any shrinkage at 150°C exhibits high porosity (80%), high electrolyte-uptake (1350%), and good ionic conductivity (1.2×10^{-3} S cm^{-1}). The thermal shutdown function of PE@PI has been confirmed by both scanning electron microscopic (SEM) and electrochemical impedance spectroscopic (EIS) analyses. The full cell battery tests reveal that the cell using the PE@PI separator shows a flatter first cycle charge-discharge plateau and better capacity retention at high C rates (104 mAh g^{-1} at 1 C, 81% retention) in comparison with that utilizing the Celgard 2325 separator (88 mAh g^{-1} at 1 C, 70% retention). The high electrolyte uptake of the highly porous PE@PI film facilitates the ion conduction, which is the main reason enhancing the battery performance, revealing a promising separator for the advanced LIB application.

https://iopscience.iop.org/article/10.1149/2.0071914jes/meta

Abstract

Functionalised polyimide (PI) separators, with high electrolyte wettability and good thermo-dimensional stability, in combination with electrolytes provide ionic conductivities > 1 mS for electrical double-layer capacitors (EDLCs) and lithium-ion batteries (LIBs). The mechanical strength of PI separators can be further improved by a factor of 3 via the optimisation of ratio of soft and hard segments, and the introduction of 5% SiO_2 nanoparticles (NPs). The electrolyte uptake capability and ionic conductivity of this copolymerized PI separator is also promoted by the addition of SiO_2 NPs, favouring the high-rate performances of EDLCs and LIBs. The cyclic voltammetry (CV) curves of an EDLC with this separator show the rectangle shape of a typical capacitor, indicating the low ionic resistance of this copolymerized PI separator. For the usage in the LIBs, on the other hand, a coating of low-density polyethylene (LDPE) onto this PI-SiO_2 (PI–SiO_2@PE) separator enables the thermal shutdown function of a LIB without sacrificing cell performance. There is no significant change in morphology for this PI-SiO_2@PE separator after the 50-cycle full cell test, indicating its promising application potential in LIBs. The study has demonstrated the ability to tailor the multi functionality of the polyimide separator to optimise it properties for specific applications.

https://www.sciencedirect.com/science/article/pii/S0378775320313501

Abstract 101 – a quick recap

- Length:
  - RA “abstracts usually consist of a single paragraph containing from about 4 – 5 full sentences.” (Swale & Feak, 2004: 282)
- Content:
  - Two main approaches: (1) summary, provides 1 or 2 sentences synopses of each of the IMRD/IPTC sections; (2) results-driven, concentrating on research findings and what might be concluded from them. (Swale & Feak, 2004: 282)
- Language:
  - “There appears to be considerable disciplinary and individual tense variation with sentences dealing with results.” (Swale & Feak, 2004: 283)

Abstract 時態：All present tense.（描述已完成作60，

Background

Aim

Method

Abstract—1T1MTJ spin-transfer-torque (STT)-MRAM is a promising candidate for next-generation high-density embedded non-volatile memory. This paper presents a 1-Mb 28-nm 1T1MTJ STT-MRAM with improved sensing margin and reduced power consumption. An offset-cancelled sense amplifier is proposed, using only a single capacitor, to improve sensing margin and accelerate read speed. To save write power, an *in situ* write-self-termination method is proposed where the sense amplifier is reconfigured without area overhead to continuously monitor the write operation and shutoff the write drivers as soon as the magnetic transition occurs in the bitcell. A prototype chip achieves 2.8- and 3.6-ns read access time at 25 °C and 120 °C, respectively. The *in situ* write-self-termination scheme reduces write power by 47% and 60% with 20-ns write access time at 25 °C and 120 °C, respectively.

results, also a conclusions

採用 simple IMRD 格式

Abstract 內大部分都是使用現在簡單式呈現客觀事實或現況

ABSTRACT

Most oxygen evolution reaction (OER) electrocatalysts are not stable in corrosive acids. Even the expensive RuO_2 or IrO_2, the most acid-resistant oxides, can be dissolved at an oxidative potential. Herein, we realize that the failures of OER catalysts are mostly caused by the weak interface between catalysts and the substrates. Hence, the study of the interface structure between catalysts and substrates is critical. In this work, we observe that the cheap OER catalysts Co_3O_4 can be more durable than the state-of-the-art RuO_2 if the interface quality is good enough. The Co_3O_4 nanosheets deposited on carbon paper (Co_3O_4/CP) is prepared by electroplating of Co-species and followed by a two-step calcination process. The 1st step occurs in vacuum in order to maintain the surface integrity of the carbon paper and converts Co-species to Co(II)O. The 2nd step is a calcination in ambient conditions which enables the complete transformation of Co(II)O to Co_3O_4 without degrading the mechanical strength of the Co_3O_4-CP interface. Equally important, an *in situ* formation of a layer of amorphous carbon on top of Co_3O_4 further enhances the OER catalyst stability. Therefore, these key advances make the Co_3O_4 catalyst highly active toward the OER in 0.5 M H_2SO_4 with a small overpotential (370 mV) to reach 10 mA/cm^2. The observed long lifetime for 86.8 h at a constant current density of 100 mA/cm^2 is among the best of the reported in literature so far, even longer than the state-of-art RuO_2 on CP. Overall, our study provides a new insight and methodology for the construction of a high-performance and high stability OER electrocatalysts in corrosive acidic environments.

描述進行此研究之原因

實驗方法與數據，以及討論 highlights

簡單的總

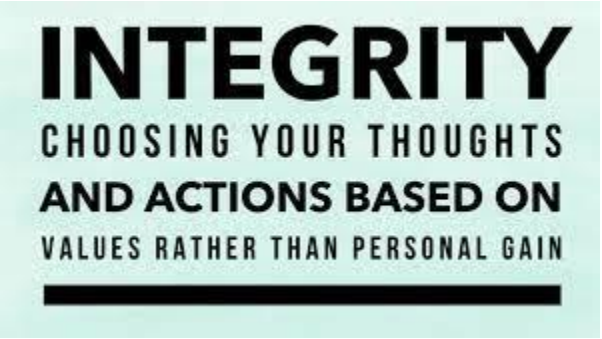
- General – specific/Problem-solution patterns.
- Connections between ideas/sentences/paragraph. → Flow
- Word choice. (e.g., single verbs, summary word)
- Active/passive voices in diff. sections.
- Tense in diff. sections.
- - ing clause (cause – effect)
- Data commentary structure
- Reporting verbs (Table vs Figure))
- Hedge (soften) vs boost (strengthen) claim
- Condensed/extended methods section

- Research writing is evidence-based. → **Accuracy & Objectivity**
- You say what you can prove; you say what's from you. → **Honesty**


Values & beliefs
Conduct & behaviors
Consequences
Honesty
Good research writing
A healthy scientific community

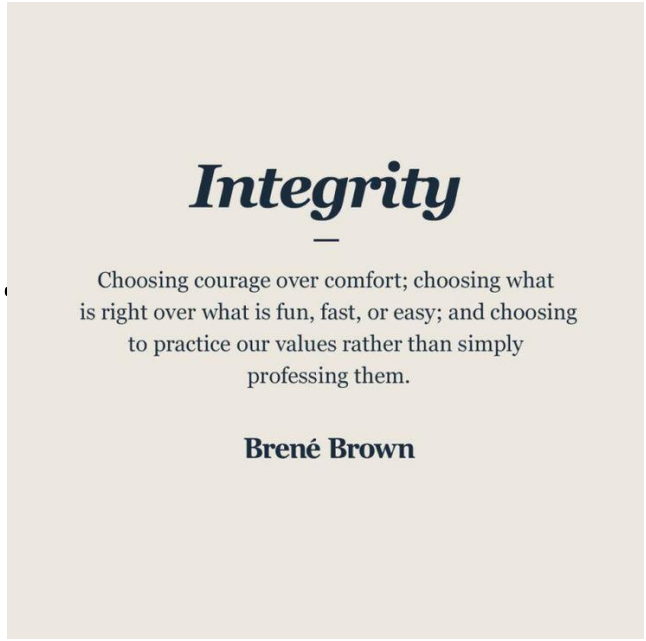
Good science, honest science.

- **Honesty** in “developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way.”
- **Honesty**: “conveying information truthfully and honoring commitments.”



Take-away messages

- 學做研究，就是學做人：**誠信**是最高原則。
- Honesty is the best policy.
- Good people, good research.



學術研究寫作的倫理實踐

Let's read *for* Writing! ☺

And write with integrity.

感謝聆聽！

- Any thoughts?
  yyhuang@mx.nthu.edu.tw
    - LinkedIn: Yun-yin Huang

MOOC:

De-constructing Research Articles

https://mooc.nthu.edu.tw/course/info/227

References

- Engeström, Yrjö (1987). *Learning by Expanding: An Activity-theoretical Approach to Developmental Research*. Orienta-Konsultit Oy.
- Steneck, N. H., & United States. (2007). *ORI introduction to the responsible conduct of research*. Rockville, Md.: Dept. of Health and Human Services.
- Swales, J. M., & Feak, C. B. (2004). Academic writing for graduate students: Essential tasks and skills. Ann Arbor, Mich: University of Michigan Press.
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