

WRITING THE LITERATURE REVIEW SCIENCES

UCLA Graduate Writing Center

2019



Reading Papers Strategically

First Pass

- Read the abstract for a broad overview
- Read the introduction and discussion/conclusion
- Skim the text to see headings and sub-headings in order to understand the “geography of the text”—its structure

Second Pass, More Careful Reading

- **Annotate** your sources for the issues most relevant to you; do not take notes beyond what you need. Maybe the focus is on findings, or methods, etc. Be targeted and efficient.
- **Tools**—use a bibliographic tool like Zotero or Mendeley for capturing the citation and paper. Assign keywords. Use notes fields in these programs or put notes into pdf.



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Preparing for Longer Reviews

Export from Zotero to Create Spreadsheet Table

- Zotero lets you add tags (keywords) and notes to the sources in your library.
- You can export a Zotero library or a specific search as a .csv file, which easily converts to Excel.
- For example, decide what topics or keywords you will address in your background section or lit review; then do multiple searches on these keywords; export each search to its own work book page
- If you have a lot of sources and don't need to cite them all (or they are not all that relevant), have a column where you give a rating for each—must cite, maybe cite, A/B/C



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Preparing for Longer Reviews

Create Spreadsheet Table

AutoSave Off Literature Database.xlsx - Saved Ariella Machness

File Home Insert Page Layout Formulas Data Review View Add-ins Help novaPDF Team Tell me what you want to do Share

Paste Font Alignment Number Styles Cells Editing

Clipboard Font Alignment Number Styles Cells Editing

11

	A	B	C	D	E	F	G	H	I	J
1	Author	Title	Journal	Year	Procedure/Main Results	Innovation	Characterization techniques	Potential future direction		
1	P. Granitzer et al	Assessment of Magnetic Properties of Nanostructured Silicon Loaded with Superparamagnetic Iron Oxide Nanoparticles	ECS Journal of Solid State Science and Technology	2015	Highly n-doped silicon wafer, 10 wt% HF, current density of 100 mA/cm ² , avg. pore diameter 60 nm, particles ~ 2 μm. NP of 4, 5, 8 and 10 nm (hexane solution), 20 min. Infiltration by adding particle solution dropwise on porous Si surface. Process	Increase in infiltration depth with decreasing concentration. 8 nm np infiltrated with varying concentration and blocking temp. EDX spectra observed.	SEM, EDX, SQUID, VSM, FTIR (for evidence of oxidation)	Observing magnetization and heating efficiency		
2	J.M. Kinsella et al	Enhanced Magnetic Resonance Contrast of Fe ₃ O ₄ Nanoparticles Trapped in a Porous Silicon Nanoparticle Host	Advanced Healthcare Materials	2011	irreg. shaped NPs 180-220 nm, pore size 16 nm. Si NPs loaded with oleic acid-coated 9 nm Fe ₃ O ₄ np (suspended in chloroform). Oxidation of nanocomp. (180 °C, 4 h). At low levels of Fe ₃ O ₄ , sat. magnetization decreased relative to free powder. Increases in sat. magnetization as Fe ₃ O ₄ loading increases, switches from superpara to ferromag behavior (At Fe ₃ O ₄ :pSi mass ratios > 50%). No statistically signif. loss in cell viability observed with either component after 24 h. pSi composite and empty pSi circulation half-lives of 1.6 and 1.5 h. Cy7 conjugate released from particle surface during degradation and penetrated lung	Magnetic resonance properties quantified. In vivo analysis using hepatocellular carcinoma (HCC) Sprague Dawley rat model determined biodistribution, cytotoxicity properties.	SQUID, dynamic light scattering (DLS), TEM, MRI, inductively coupled plasma-optical emission spectroscopy (ICP-OES) to quantify concentrations of iron and silicon in bloodstream. Biodistribution of the nanoparticle formulations in hepatocellular carcinoma (HCC)-burdened rats were performed by ex	Utilize the NPs for imaging applications rather than hyperthermia therapy		
3	M.J. Sailor et al	Delivery of nanogram payloads using magnetic porous silicon microcarriers	Lab on a Chip	2006	Wafers etched at 200 mA/cm ² for 2 min or 4 min (particles) in 3:1 49% HF highly p-type, pore sizes of 50-100 nm. Removed by 90 s, 25 to 40 mA/cm ² current density pulse in a 1:13.5 aqueous 49% HF, pSi film covered in (300-400 μL) magnetite np 30 nm (aqueous solution), pSi particles sonicated in EtOH supernatant removed and magnetite suspension stirred in pSi solution. Also loaded into film and after 4 min particles rinsed, oxidized at	Quantify the amount of E. pronaase loaded into nanocomposite. Deliver single microparticle with active enzyme to reaction vessel with few microliters.	SQUID and gravimetric measurements	Used for microfluidic rxn application (magnetic delivery). Not drug delivery focused. progress of the reaction was monitored in light microscope & fitted with visible light spectrometer		
4	J. Kinsella et al	Enhanced magnetic resonance contrast of iron oxide nanoparticles embedded in a porous silicon nanoparticle host	Proc. of SPIE Vol. 8594	2013	Si in HF solution (3:1 (v.v.) 48% HF:ethanol) for 150 s 400 mA/cm ² . Lifted using electropolishing in 3.3% HF solution and 4 mA/cm ² for 250 s. A	Enhancement of MRI signal, cytotoxicity studies on HepG2 liver cancer cells	XRD, assay for cytotoxicity	Use for MRI application (showing enhanced MR signals) in vivo.		

Nanocomposite utilizes magnetic field utilizes light

Ready 60%

Preparing for Longer Reviews

Create Spreadsheet Table

Microsoft Excel interface showing a spreadsheet titled "Literature Database.xlsx". The ribbon includes File, Home, Insert, Page Layout, Formulas, Data, Review, View, Add-ins, Help, novaPDF, Team, and Tell me what you want to do. The Home ribbon is active, showing options for Clipboard, Font, Alignment, Number, Styles, Cells, and Editing.

The spreadsheet contains a table with the following columns: Author, Title, Journal, Year, Procedure/Main Results, Innovation, Characterization techniques, and Potential future direction. The table lists four entries related to nanocomposites and magnetic properties.

1	Author	Title	Journal	Year	Procedure/Main Results	Innovation	Characterization techniques	Potential future direction
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At the bottom of the spreadsheet, a filter is applied to the "Author" column, showing "Nanocomposite" selected. Below the spreadsheet, there are navigation arrows and a status bar showing "Ready".

Lit Review Basics

- The literature review should contain a critical summary of the previous work that has been done on your topic
- Doesn't merely summarize previous research on your topic, but tells an integrated research story and indicates how your research will contribute to the field
- In journal articles and grants, the introduction includes the background of relevant previous research
- In theses and dissertations, you can have a more extended background or lit review, even a separate chapter (from the intro) that is close to a stand-alone review article



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Lit Review – Some Organizational Options

Topical (most common)

- Breaks up lit review into a number of subfields, subject areas, or approaches and discusses each individually

Distant-to-Close

- A kind of topical organization that starts with studies of general relevance to topic and ends with studies most relevant to topic

Chronological

- Reviews studies chronologically from older to most recent

Debate

- Emphasizes opposing positions in field, especially long-term

Seminal Study

- Starts with focused engagement and analysis of 1-2 key studies relevant to your project



Discussion of example

- Read the introduction to the paper: Multi-messenger Observations of a Binary Neutron Star Merger
- What kinds of organizational patterns do you see in the introduction? (topical, distant-to-close, chronological, seminal paper, debate)



3 Rhetorical Moves that Frame Original Research

- Move 1: *Establishing a Research Territory*
 - Show that the general research area is important, central, interesting, problematic, or relevant in some way
 - Introduce and review items of previous research in the area
- Move 2: *Creating a Niche*
 - Indicate a gap in the previous research, or extend previous knowledge in some way
- Move 3: *Occupying the Niche*
 - Outline purposes or state the nature of the proposed research
 - List research questions or hypotheses
 - State the value of the proposed research (significance)



Move 1 Language: Establishing Research Territory

Indicating Centrality, Importance

Recently, there has been growing interest in

The possibility that . . . has generated interest in
the development of

Knowledge of . . . has a great importance for

The study of . . . has become an important aspect of

The . . . has been studied by many investigators.

Many recent studies have addressed

The relationship between . . . and . . . has received
a lot of attention in previous studies.



Move 1 Language: Establishing Research Territory

Summarizing Previous Research

Evidence of . . . was first reported in

The majority of studies have focused on

Previous studies have suggested that

Some progress has been made towards understanding
the . . . behavior of

Various investigations have explored the relationship
between . . . and

There is mounting evidence that the use of

These findings were further supported by later studies
that showed



Move 2 Language: Establishing the Research Gaps

Negative Openings / Quasi-negative subject

However, little information . . .

 little attention . . .

 little data . . .

 little research . . .

However, few studies . . .

 few investigations . . .

 few researchers . . .

No studies/data/calculations to date have

None of these studies/findings/calculations have



Move 2 Language: Establishing the Research Gaps

Negative / Quasi-Negative Openings: More Examples

However, very few investigations have considered
the effects of

Little attempt has been made to explain why

There have been few published studies that directly
address

A review of the recent literature yield only two reports
on

None of the prior studies have established

Earlier studies were limited to the problem of



Move 2 Language: Establishing the Research Gaps

Contrastive statements

Research has tended to focus on . . . , rather than on

These studies have emphasized . . . , as opposed to

Although considerable research has been devoted to . . . ,
rather less attention has been paid to

Most studies have been content to Little attempt has
been made to explain why



Move 2 Language: Establishing the Research Gaps

Raise a question, hypothesis, or need for more research

However, it remains unclear whether

It would thus be of interest to learn how

If these results could be confirmed, they would provide strong evidence for

If further research were done, it could lead to effective approaches to

It would seem, therefore, that further investigations are needed in order to



Move 3 Language: Filling the Research Gap

Indicating what the present study accomplishes

Referring to the type of *text*—“This paper...”
paper, article, thesis, report, research note

Referring to type of *investigation*—“This study...”
experiment, investigation, study, survey

Referring to the text usually in present tense

Referring to the investigation can be in either tense (past as you have already performed the study or present to make it seem new or current)



Move 3 Language: Filling the Research Gap

Some examples

This paper reports on the results obtained

The present work is concerned with.

The primary focus of this paper is on how to
maximize

In the present investigation, . . . have been
studied.

We have investigated the effect of

Therefore, we developed a new . . . as an
alternative for



Review Examples and Look for Moves

- Move 1: *Establishing a Research Territory*
 - Show that the general research area is important, central, interesting, problematic, or relevant in some way
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- Move 3: *Occupying the Niche*
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Adapted from John Swales' "Creating a Research Space" (CARS) approach to introductions



Discussion of example: Rociletinib in *EGFR*-Mutated Non--Small-Cell Lung Cancer

- Read the introduction to the following paper:

Rociletinib in *EGFR*-Mutated Non--Small-Cell Lung Cancer

- Where do you see the 3 moves taking place in the introduction?



Discussion of example: Rociletinib in *EGFR*-Mutated Non--Small-Cell Lung Cancer

Increasingly, treatment decisions for patients with non–small-cell lung cancer (NSCLC) are based on the driver mutation rather than the histologic subtype, when such mutations are present. Mutations in the gene encoding epidermal growth factor receptor (*EGFR*) are among the most common oncogenic mutations in lung adenocarcinoma and are present in approximately 10 to 15% of Western patients and 30 to 35% of Asian patients.¹ At the time of diagnosis, approximately 90% of *EGFR*-mutation–positive patients have one of two activating mutations, an in-frame deletion in exon 19 or an L858R point mutation in exon 21.¹ The first-generation and second-generation *EGFR* tyrosine kinase inhibitors gefitinib, erlotinib, and afatinib are highly active against cancers with these mutations, with objective response rates of 50 to 70%.²⁻⁴



Discussion of example: Rociletinib in *EGFR*-Mutated Non--Small-Cell Lung Cancer

However, acquired resistance develops after a median of 9 to 13 months²⁻⁴ and is most commonly due to the *EGFR* T790M mutation, present in approximately 50 to 60% of resistant cases.^{5,6} There are no approved therapies that specifically target T790M, so cytotoxic chemotherapy is typically used. The median survival is less than 2 years after the emergence of T790M.⁶



Discussion of example: Rociletinib in *EGFR*-Mutated Non--Small-Cell Lung Cancer

Rociletinib (CO-1686; Clovis Oncology) is a small-molecule, orally available, mutant-selective covalent inhibitor of commonly mutated forms of EGFR, including exon 19 deletions, L858R, and T790M, but not exon 20 insertions. Preclinical studies have confirmed that rociletinib has minimal activity against wild-type EGFR.⁷ In contrast, currently approved EGFR tyrosine kinase inhibitors result in substantial inhibition of nonmutant EGFR, leading to rash and diarrhea as their two most common and dose-limiting side effects. In xenograft models with *EGFR*-activating mutations alone or combined with T790M resistance mutations, rociletinib resulted in durable tumor shrinkage,⁷ which was most marked when plasma concentrations were maintained at more than 200 ng per milliliter across the dosing interval.



Discussion of example: Rociletinib in *EGFR*-Mutated Non--Small-Cell Lung Cancer

Therefore, we performed a phase 1–2 study of rociletinib in patients with *EGFR*-mutated NSCLC with acquired resistance to first-generation or second-generation EGFR tyrosine kinase inhibitors such as erlotinib, gefitinib, or afatinib.



Brainstorm around Existing Knowledge and Gaps

Creating a Research Space	Questions to Ask	Answer Questions Based on Existing Lit
Move 1: Establishing a Research Territory	<u>What do we know?</u> (about this topic, concept, source)	<ul style="list-style-type: none">• We know that...• Studies have shown that..
Move 2: Defining the Research Gap	<u>What do we not know?</u> (that we should want to know)	<ul style="list-style-type: none">• We do not know...• Scholars have not yet investigated...
Move 3: Filling the Gap	<u>What do we want to find out?</u> <u>Why is that important for the field?</u>	<ul style="list-style-type: none">• My study will examine...which is important because...



Different Ways of Mapping

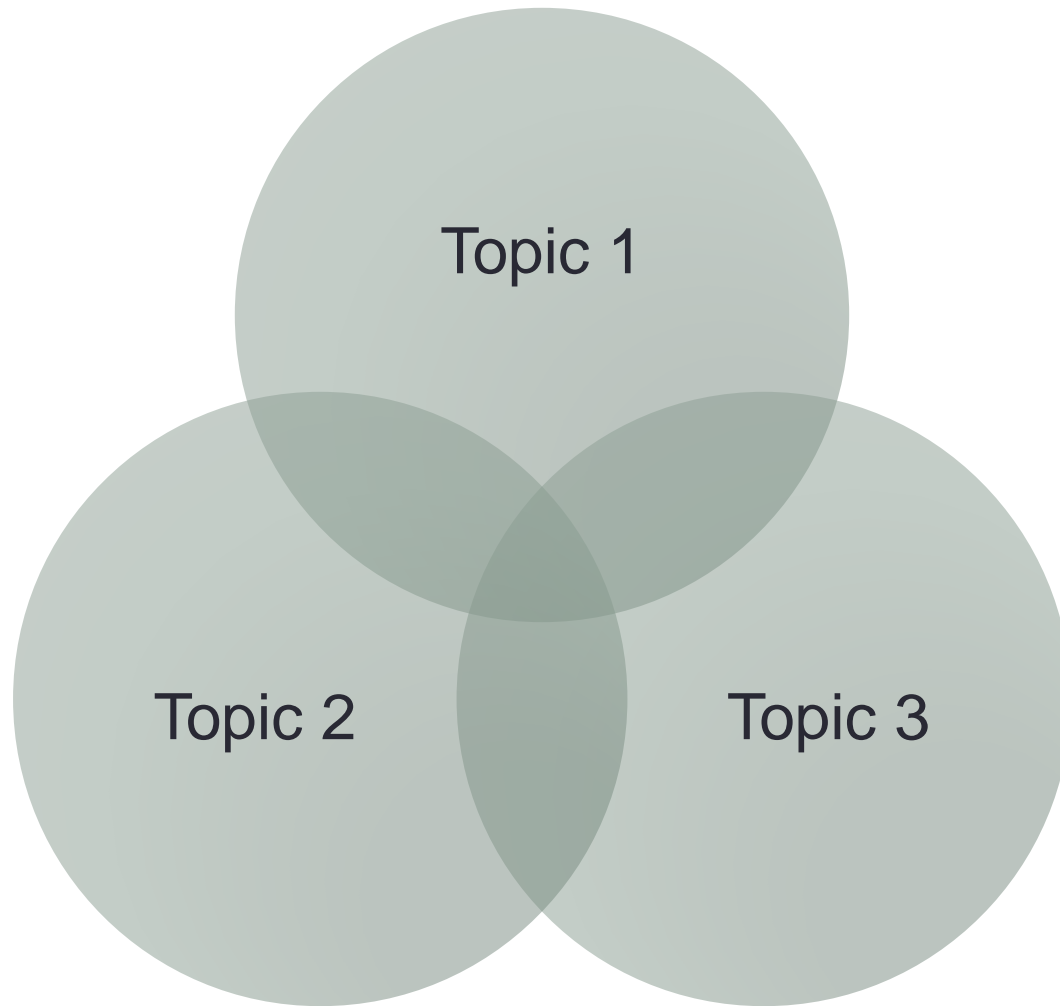
- Venn Diagram (Rudestam & Newton, 2007)
- Conceptual Maps/Diagrams (Creswell, 2013)
- Various Types of Maps/Diagrams (Maxwell, 2013)
- Various Types of Maps Diagrams (Hart, 1998)

Hart, C. (1998). *Doing a literature review: Releasing the social science research imagination*. Sage.

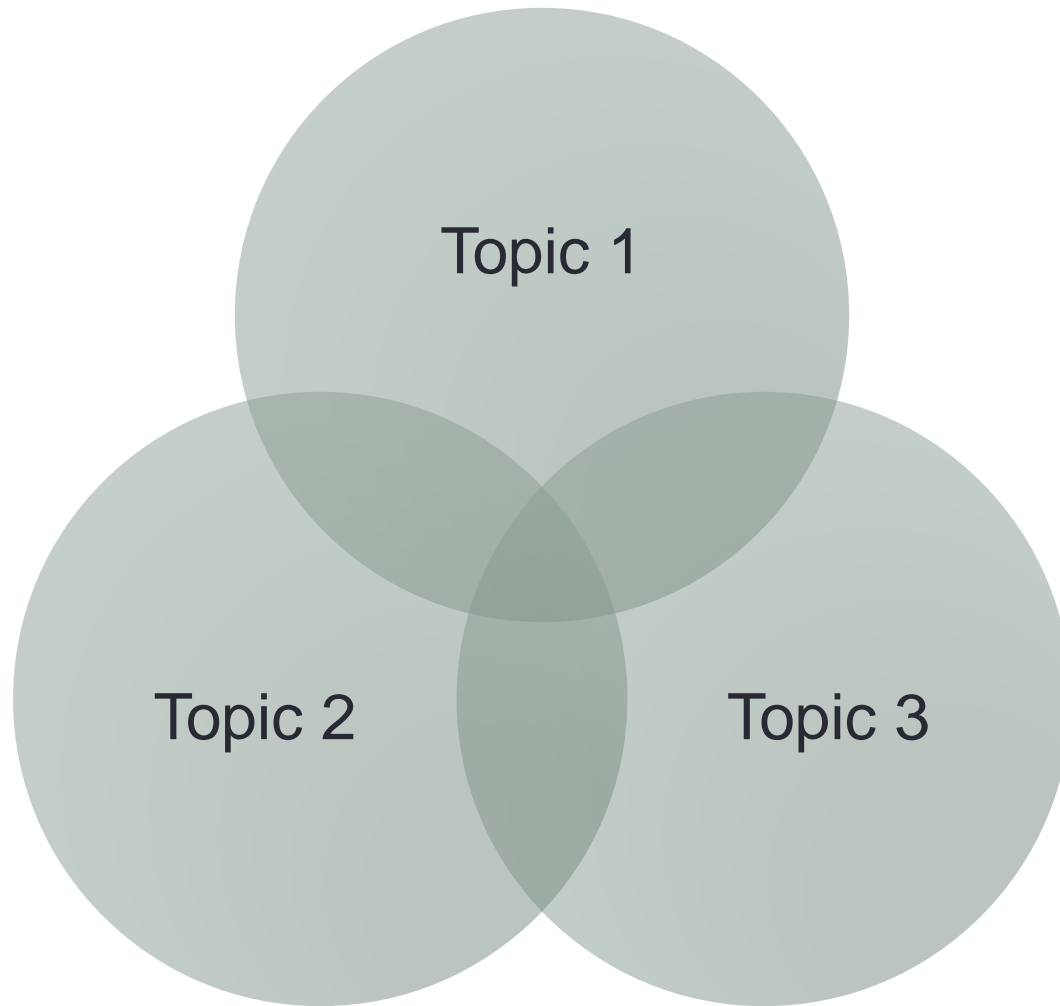
- We will focus on Venn Diagrams for doing simple categorization of previous studies
- Caveat: If you're not fond of mapping/drawing, you can also track similar information (topics, concepts, theories, variables, methods) through key words in either Zotero or a carefully constructed Excel spreadsheet



Venn Diagram of Relevant Literature



Venn Diagram of Relevant Literature



Mind Mapping Relevant Literature

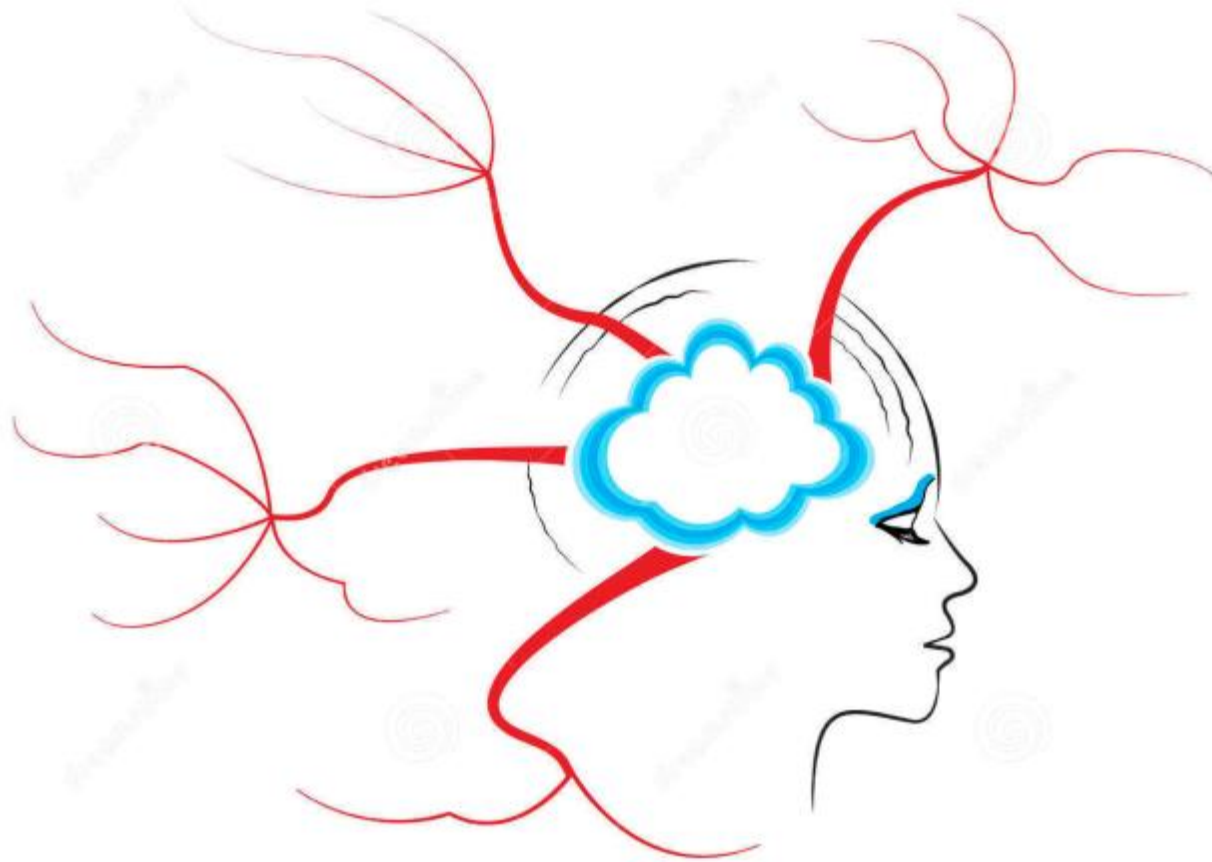


Diagram Exercise

- Review introduction/background for one of the articles
- Create a tentative diagram of key areas of existing research using either a Venn diagram or a mind map
- Think about where citations would fit in the diagram, especially overlaps of circles



EXAMPLE: Multi-messenger Observations of a Binary Neutron Star Merger

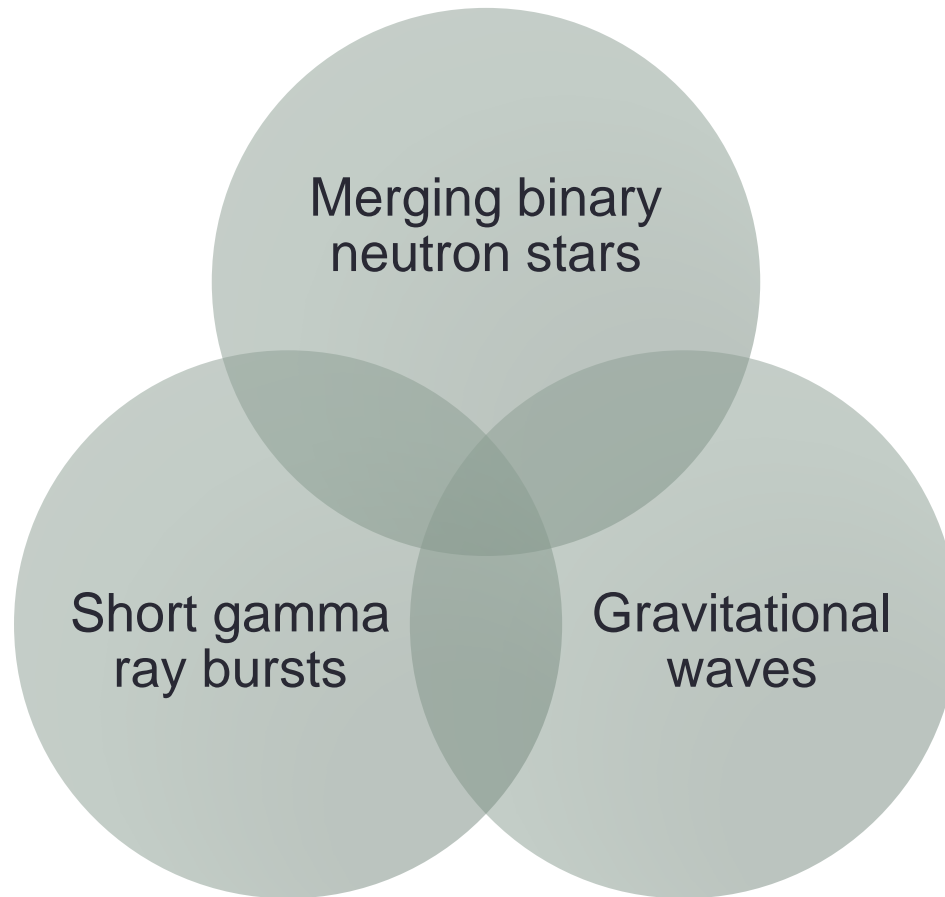
Abstract

On 2017 August 17 a binary neutron star coalescence candidate (later designated GW170817) with merger time 12:41:04 UTC was observed through gravitational waves by the Advanced LIGO and Advanced Virgo detectors. The *Fermi* Gamma-ray Burst Monitor independently detected a gamma-ray burst (GRB 170817A) with a time delay of ~ 1.7 s with respect to the merger time. From the gravitational-wave signal, the source was initially localized to a sky region of 31 deg^2 at a luminosity distance of 40^{+8}_{-8} Mpc and with component masses consistent with neutron stars. The component masses were later measured to be in the range 0.86 to $2.26 M_{\odot}$. An extensive observing campaign was launched across the electromagnetic spectrum leading to the discovery of a bright optical transient (SSS17a, now with the IAU identification of AT 2017gfo) in NGC 4993 (at ~ 40 Mpc) less than 11 hours after the merger by the One-Meter, Two Hemisphere (1M2H) team using the 1 m Swope Telescope. The optical transient was independently detected by multiple teams within an hour. Subsequent observations targeted the object and its environment. Early ultraviolet observations revealed a blue transient that faded within 48 hours. Optical and infrared observations showed a redward evolution over ~ 10 days. Following early non-detections, X-ray and radio emission were discovered at the transient's position ~ 9 and ~ 16 days, respectively, after the merger. Both the X-ray and radio emission likely arise from a physical process that is distinct from the one that generates the UV/optical/near-infrared emission. No ultra-high-energy gamma-rays and no neutrino candidates consistent with the source were found in follow-up searches. These observations support the hypothesis that GW170817 was produced by the merger of two neutron stars in NGC 4993 followed by a short gamma-ray burst (GRB 170817A) and a kilonova/macronova powered by the radioactive decay of r -process nuclei synthesized in the ejecta.

Key words: gravitational waves – stars: neutron



EXAMPLE: Multi-messenger Observations of a Binary Neutron Star Merger



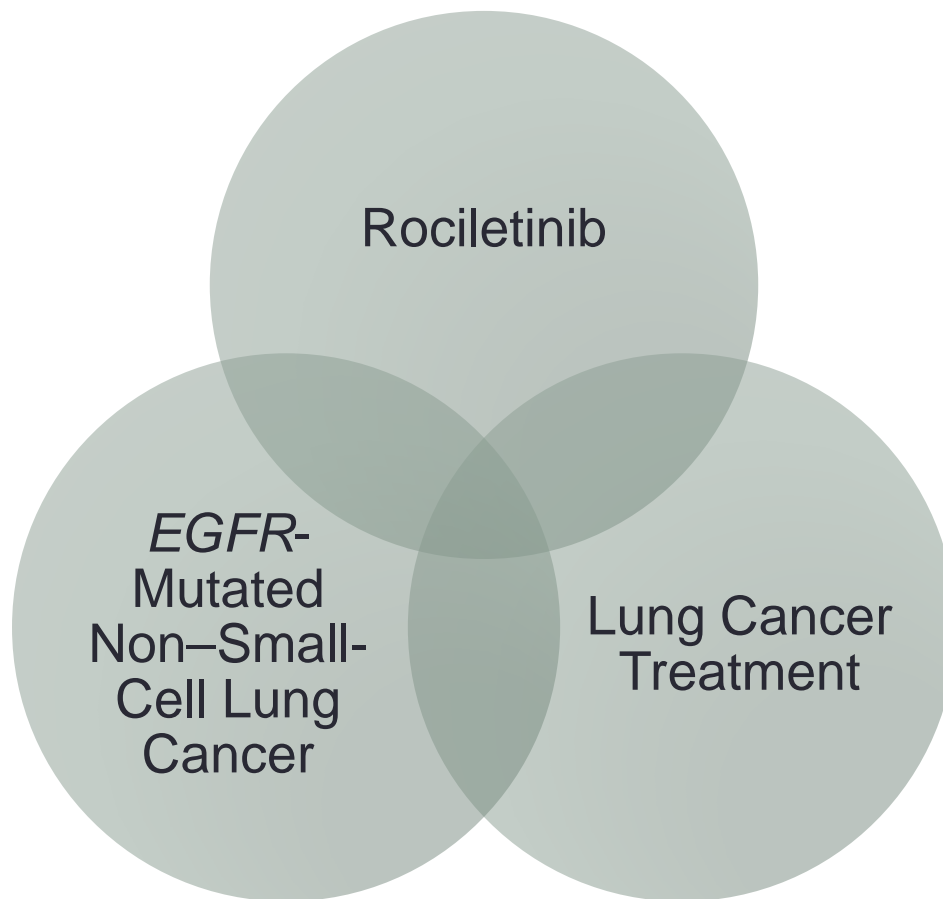
Example: Rociletinib in *EGFR*-Mutated Non–Small-Cell Lung Cancer

- **ABSTRACT BACKGROUND**

Non–small-cell lung cancer (NSCLC) with a mutation in the gene encoding epidermal growth factor receptor (*EGFR*) is sensitive to approved EGFR inhibitors, but resistance develops, mediated by the T790M *EGFR* mutation in most cases. Rociletinib (CO-1686) is an EGFR inhibitor active in preclinical models of *EGFR*-mutated NSCLC with or without T790M.



Rociletinib in *EGFR*-Mutated Non–Small-Cell Lung Cancer



A few words about longer reviews

- Review article (literature review as a publication)
 - Graduate students sometimes publish these when they are working in an emerging fields.
 - Otherwise they are more commonly published by more senior academics.
- Literature review chapter in dissertation, usually in a form similar to a review article.
 - Some departments require this type of dissertation chapter



Example of published review article

Krogh, L., Vlach, H., & Johnson, S. P. (2013). Statistical learning across development: flexible yet constrained. *Frontiers in psychology*, 3, 59

Much research in the past two decades has documented infants' and adults' ability to extract statistical regularities from auditory input. Importantly, recent research has extended these findings to the visual domain, demonstrating learners' sensitivity to statistical patterns within visual arrays and sequences of shapes. In this review we discuss both auditory and visual statistical learning to elucidate both the generality of and constraints on statistical learning. The review first outlines the major findings of the statistical learning literature with infants, followed by discussion of statistical learning across domains, modalities, and development. The second part of this review considers constraints on statistical learning. The discussion focuses on two categories of constraint: constraints on the types of input over which statistical learning operates and constraints based on the state of the learner. The review concludes with a discussion of possible mechanisms underlying statistical learning.



Krogh et al.—Outline of article

- Introduction
- Auditory Statistical Learning
 - Artificial Language
 - Natural Language
 - Non-linguistic Stimuli
- Visual Statistical Learning
 - Infants
 - Adults
- Constraints on Statistical Learning
 - Types of Input (more subheadings)
 - The State of the Learner (more subheadings)
- Mechanisms Underlying Statistical Learning
- Conclusion



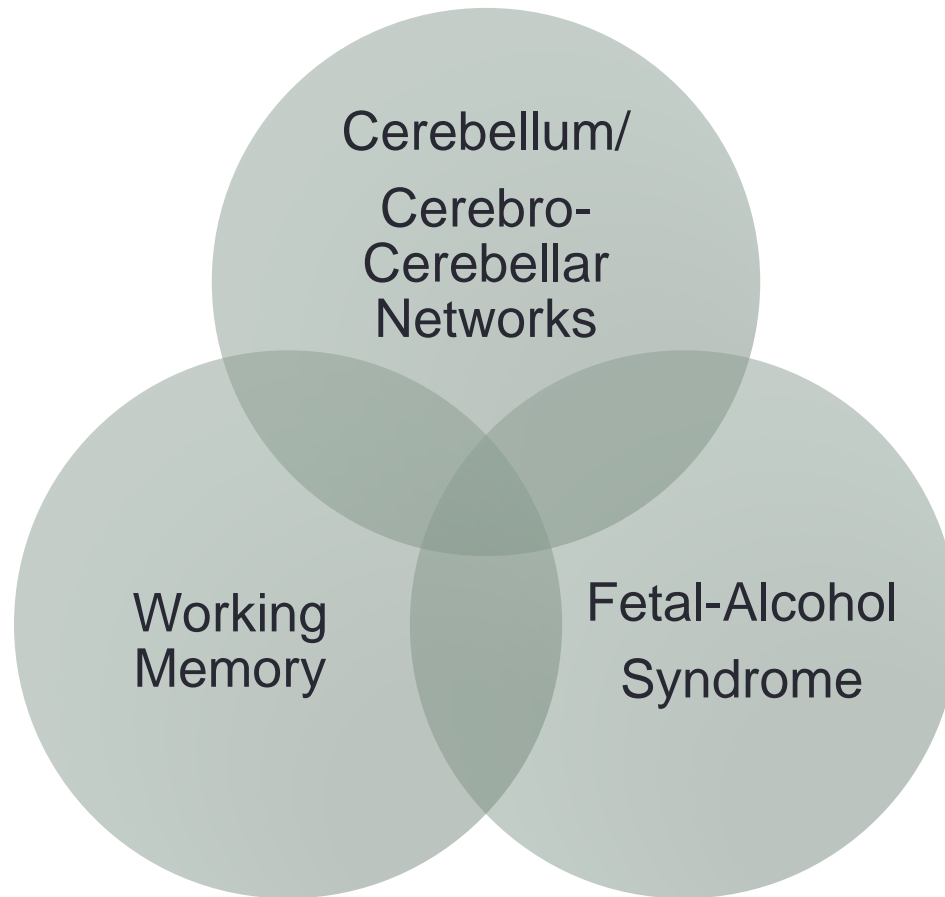
Example of dissertation chapter

O'Hare, Elizabeth D. (2008). Verbal working memory development and the cerebro-cerebellar system : structural and functional neuroimaging studies in children with and without prenatal alcohol exposure.

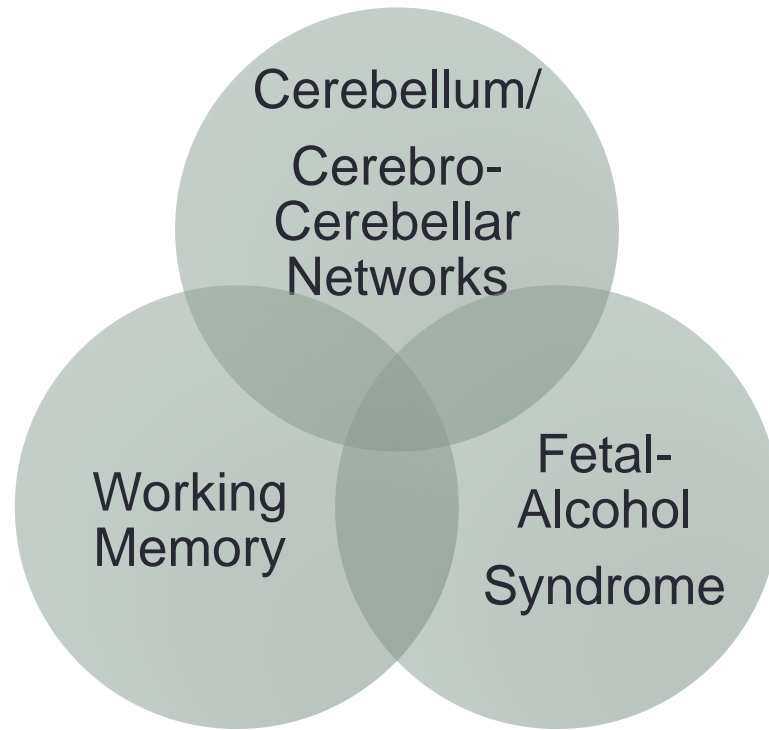
CHAPTER 2.....	10
Developmental Changes in Grey and White Matter in the Human Brain.....	10
Cognitive Development of Working Memory.....	28
Cognitive Development and the Cerebellum.....	32
Role of the Cerebellum and Cerebro-Cerebellar Networks in Verbal WM.....	36
Overview of Fetal Alcohol Spectrum Disorders.....	39
The Cerebellum and Cerebro-Cerebellar Networks in FASD.....	45
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Verbal working memory development and the cerebro-cerebellar system...



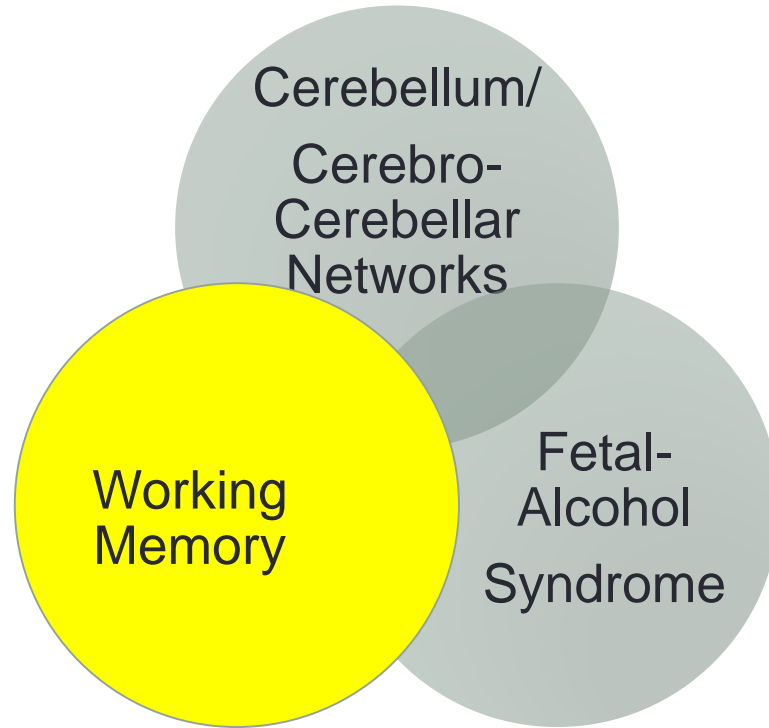
O'Hare (2008)



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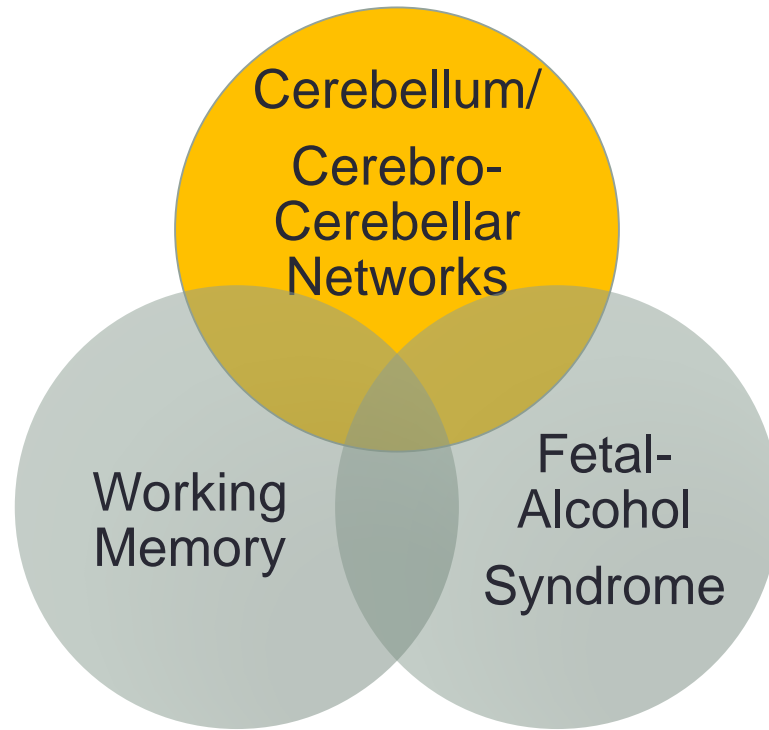
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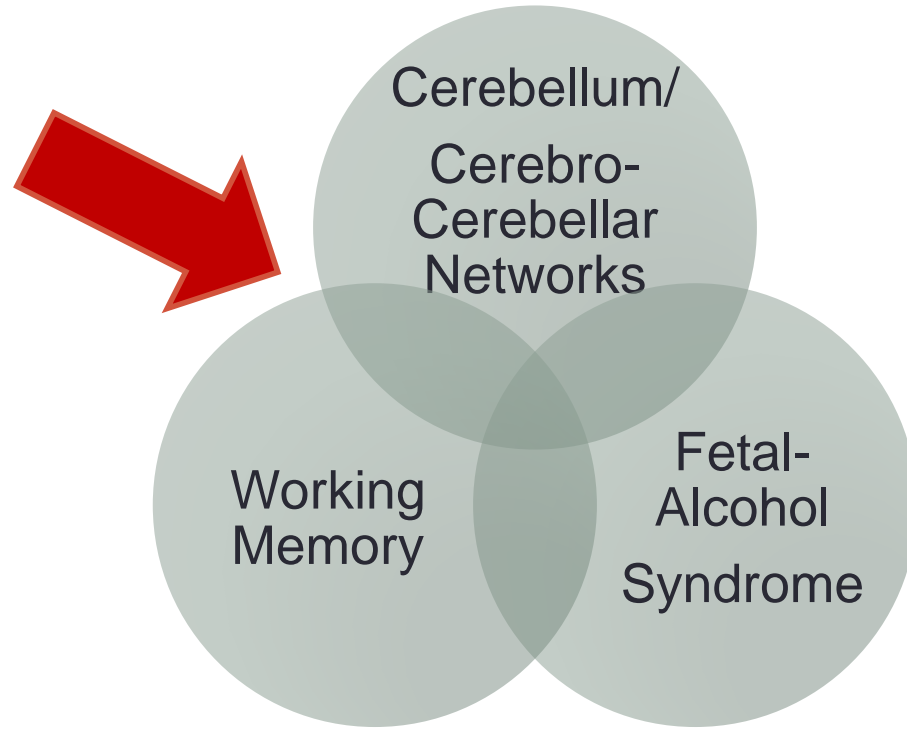
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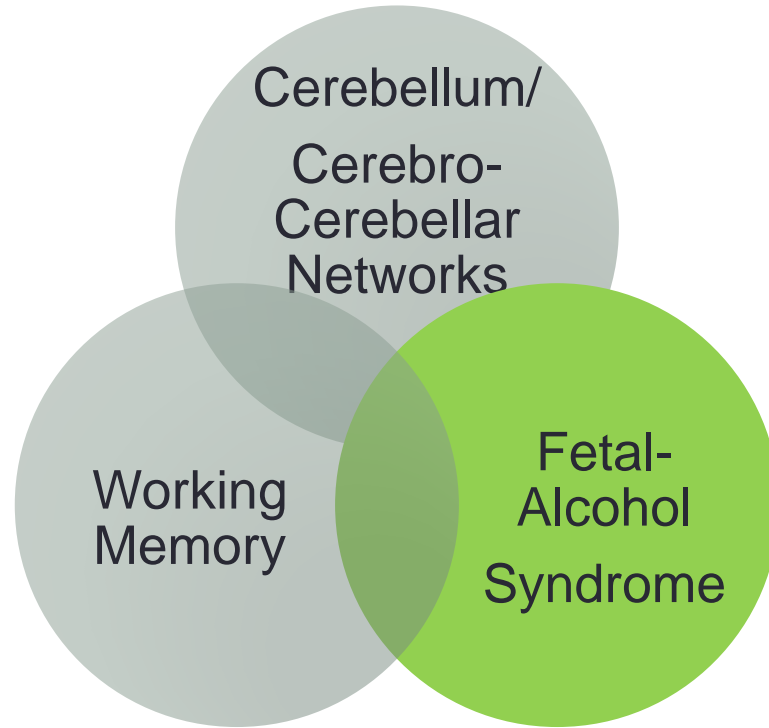
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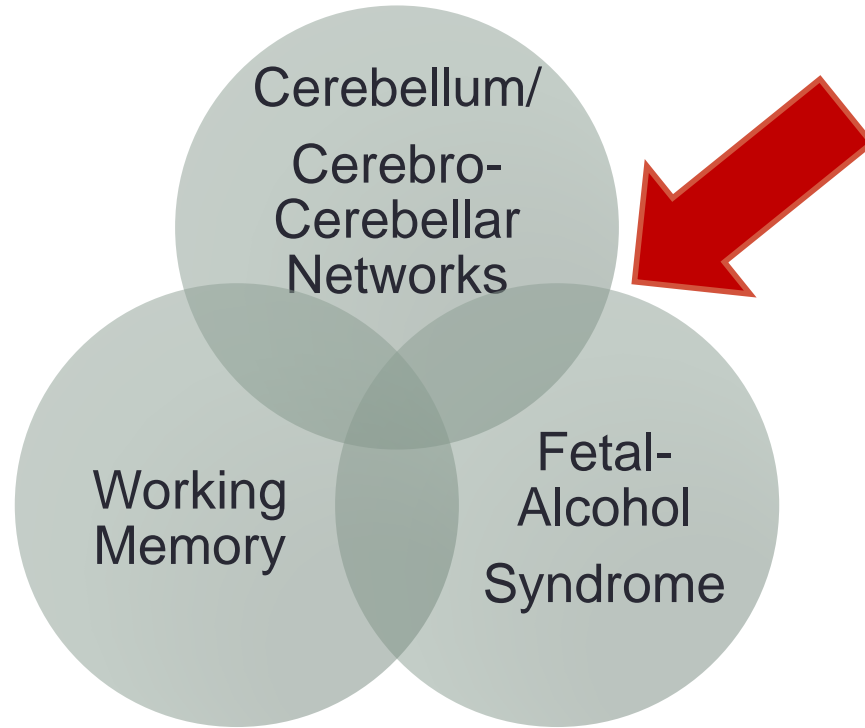
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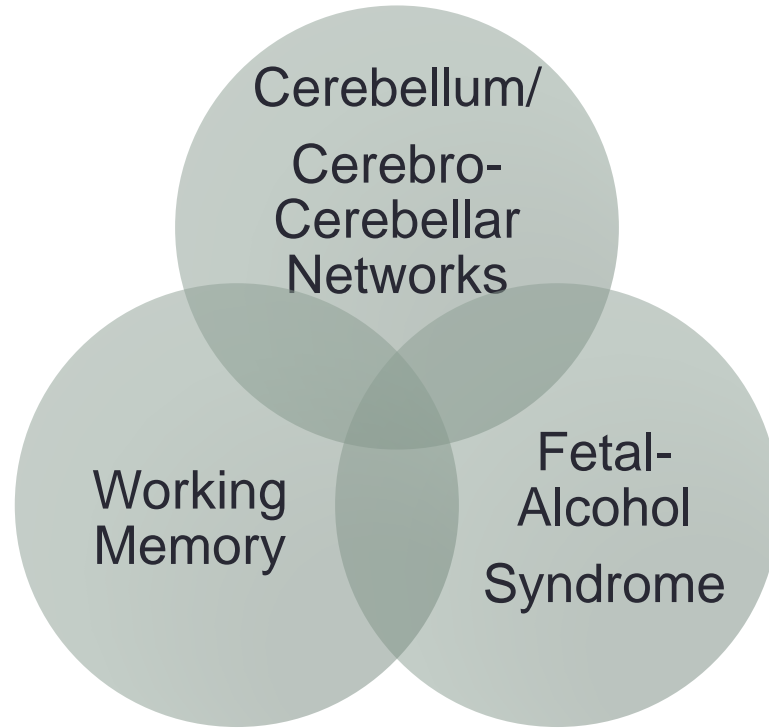
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Narrative vs Systematic Review

- The above examples from psychology (review article) and neuroscience (dissertation chapter) would both be what you would call a “narrative review”
- Systematic reviews are becoming more common in health research, and they need to certain agreed-upon criteria for how they are developed, such as describing:
 - clear search parameters and protocols
 - criteria for eligibility and exclusion from literature
 - methods for extracting data from literature
 - methods for analyzing these data
 - analysis of bias across studies
- PRISMA guidelines for systematic reviews (<http://www.prisma-statement.org>)



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Genre Considerations

- Fellowships/short grants: background sections are so short, you often have to sketch the research territory more generally with minimal citations
- Empirical articles/long grants: vary in length somewhat—depending on field, journal, and length of article (look at models). Typically topical (one topic per paragraph). Often go through 3 moves in order, but vary more the longer they get; 1st paragraph can sometimes have all 3 moves briefly.
- Review articles, dissertation proposals, dissertations: often require a longer background/literature review; some fields may require a review article type of dissertation chapter. You may have multiple instances of the 3 moves, or at least back and forth between move 1 (what is known) and move 2 (the gaps in the field) before introducing what your study will accomplish.
- Look for models and do backwards outlines to understand the organizational patterns and 3 moves framing the research.



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Play Around with Your Own Research Topics

- Sketch a Venn diagram or other map of the topic areas for studies that relate to your research
- Pick a topical area (or concept, variable, etc.)
 - Brainstorm a list of what is known from previous research about this topic (write down statements/assertions)
 - Brainstorm a list of what is not known (write down statements using negative or contrastive language)
 - What needs to be investigated and why is it important?
- Do some reflective/exploratory writing about the research topic you are interested in and what the research territory looks like around this topic.



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