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ACRONYMS

There'll also be an index of terms, I think, but it's not written yet.

NON-SCIENCE STUFF

FLOSS free/libre open source software

GPL GNU General Public License

GNU GNUs Not Unix

PLOS Public Library of Science

OS open science

SCIENCE STUFF

GPCRS G-protein coupled receptors

RA retinoic acid

5-HT 5-hydroxytryptamine

CNS central nervous system

BHLH basic helix-loop-helix protein structural motif

VMNS visceral motor neurons

SHH sonic hedgehog

ASCL1 Achaete-scute homolog 1

1

"SCIENCE STUDIES, FEMINIST THEORY, CULTURAL STUDIES"

1.1 SCIENCE STUDIES

Feminst science studies is this and is not this; a definition in halting, circumspect manner of Donna Haraway'. Sketching tne utlines of what critical science/feminist studies are,

1.1.1 *Kuhn, Fleck, Foucault*

More on Fleck to fill in gaps in later drafts

Fleck was right, everybody should read his book[8]

Everybody thinks Kuhn[13] and *Structures of Scientific Revolution* is *the* authority on science studies, but my feelings are summarized by one of my Div III predecessors:

> "Thomas Kuhn's work occupies an awkward and somewhat inexplicable position in the contemporary intellectual environment. Kuhn's thinking, and here I refer specifically and exclusively to the thoughts put forth in The Structure of Scientific Revolutions (SSR), while conceptually worthwhile, erodes quickly under scrutiny. "
>
> -Campbell, *Essays on Biological Epistemology*, Div III in 2007

1.2 FEMINISTS!

Section Goal: *Produced knowledge as a point to analyze: a definition and brief history maybe? of feminist science studies. At the very least a summary of what science studies is or has been and what some rough goals*

Kuhn and Fleck, and possibly to some extent Foucault, established science as a cultural artifact.(probably, or at least they're the most prominent. Info to be minimally filled in later) Feminist science studies is partially tied to the 1970s movements.(I think?) Ecofeminism, *Silent Spring*, regular people mobilizing around scientific and corporate collaborations to fight environmental disaster etc; generally, looking at ways in which science interacted with society.

Maybe the science wars were important? Not clear on whether the 90s matter.

At some point in the past 30-40 years (mid-1980s?), feminist science happened; not, of course, always under one name or one set of goals. New ways of knowing overlaps with technology and science studies overlaps with philosophy of science overlaps with a plethora of other modes of analysis.

In 1994, the inimitable Donna Haraway[11] published *Cat's Cradle: Science Studies, Feminist Theory, Cultural Studies.* She defines all three terms, all of which are still applicable for me 20 years later and worth reproducing, in part, here, in an effort to define feminist science studies.

Reproducing here at least until I write my own definitions, but these do a pretty okay job

> **"Cultural studies** . . . Not culture only as symbols and meanings, not comparative culture studies, but culture as an account of the agencies, hegemonies, counter-hegemonies, and unexpected possibilities of bodily construction. . . Relentless attention to the ties of power and embodiment. . . location

> and knowledge. Unconvinced by claims about insuperable natural divides between high and low culture, science and everything else, words and things, theory and practice.
>
> **Feminist, Multicultural, and Antiracist Theory/Projects**... situated knowledges, where the description of the situation is never self-evident, never simply "concrete," always critical; the kind of standpoint with stakes in showing how "gender," "race," or any structured inequality in each interlocking specific instance gets built into the world–i.e., not "gender" or "race" as attributes or as properties, but "racialized gender" as a practice that builds worlds and objects in some ways rather than others, that gets built into objects and practices and exists in no other way... gender and race are built into practice, which is the social, and have no other reality, no origin, no status as properties ... questioning representation with a vengeance."
>
> **Science Studies:** reflexivity, constructionism... science in the making (not science made), actors and networks... science as practice and culture... the culture of no culture, the nature of no nature... All the disciplines of science studies: history, philosophy, sociology, semiology, and anthropology; but also the formation of science studies out of the histories of radical science movements, community organizing, and policy-directed work. These histories are regularly erased in the hegemonic accounts of disciplinary and interdisciplinary development in the academy and the professions."
>
> -Donna Haraway, *Cat's Cradle*, p. 66-68

I, of course, use feminist science studies as a shorthand for all of that, with the hope that a reader is aware that "feminist" implies a richer and more complex philosophical tradition than just asking "where are the women?"

1.3 WHY SHOULD LITERALLY ANY BIOLOGIST CARE ABOUT THIS?

1.3.1 *Strong Objectivity*

To the scientists born and raised on a steady diet of objectivity and scientific meaning, there's at first glance very little advantage in taking feminist or science studies into account. What even is the alternative? What if you just really want to "do science"? In response:

1. Taking people into account isn't the worst thing in the world.
2. Seen through to the end, doing science with a feminist or value-driven framework can turn out better, more robust, traditionally-measured science. This is what Sandra Harding calls "strong objectivity."

While Harding provides a lot of theoretical grandstanding on what strong objectivity is, for me it only became clear in the practical context provided in Deboleena Roy's *Feminist theory in science: working toward a practical transformation*, with assistance from UmaNarayan, *Perspectives from a Nonwestern Feminist.* The actual understanding of strong objectivity for me follows these lines:

Strut no. 1: What is the intent of scientific objectivity? To find [a] truth to help us/scientists better manipulate the world around us in pursuit of some goal.

Strut no. 2: Does "true" objectivity exist? No, because science is made by people.[1] But if you know your personal and societal inflections, you can incorporate those into analyses and experimental design. Thus,

Strut no. 3: We can better accomplish the *goals* of *scientific* objectivity by acknowledging our own biases, thus more closely, but still asymptotically, approaching the finding of a *truth* to better manipulate the world.[2]

So, scientists should care about where their work is coming from and where it's going.

generally missing an analysis and thoughts on thinking about what and where your work will go *after you're done with it.*

Notable people and works to maybe ref. here? Donna Haraway, Sandra Harding, Uma Narayan, Deboleena Roy, Banu Subramaniam, everybody from Alcoff and Potter *Feminist Epistemologies.* Also, probably both Fortun and Bernstein [9], Raskin and Bernstein [18]

1.4 POINT OF THESIS:

Figure out how to apply all of that stuff to everything else I care about: namely, open science, open neuroscience, molecular neuroscience.

1 See arguments that aren't written into this thesis yet.)

2 Example of a place strong objectivity is easilyrelevant: At SfN, I saw a poster by a lab that studies *anorexia* in rats. Their model: female adolescent rats, that are subjected to food deprivation and given access to an exercise wheel; the assumption being that *female adolescents* are more susceptible to eating disorders because of some inherent neurobiological circuit rather than the much more likely fact that young *human* women are subjected to a whole slew of cultural factors. Dumb, bad, scientific models. While they may obtain interesting data on what happens when young female rats are starved, it's completely irrelevant to anorexia nervosa in *humans*.

2 REPRESENTATION & SCIENCE

ACRONYMS

OEAC Other Euro-American Countries, including Australia, NZ, and Canada

ROW "Rest of World", anything not already included

From a "purely" numbers standpoint, scientific production is unequally distributed around the world and on a variety of axes. This is basic feminist analysis: where are the women? Where are the colonized countries? Where are the black and brown researchers, where are the queer and trans researchers?

2.1 DEVELOPING COUNTRIES

Numbers are boring, but wow, are they depressing.

In a retrospective of 5 major medical journals, Sumathipala et al.[23] examined contributions by 4 geographic areas: the UK, USA, Other Euro-American Countries, including Australia, NZ, and Canada (OEAC), and"Rest of World", anything not already included (RoW). RoW, on average, contributed 6.5% of the research literature. The highest seen was in the Lancet (12%), and of the 151 RoW articles involved, 68.9% involved authorship from a developed county in Europe or North America. 15 original papers in the journals had data from RoW w/ no RoW coauthors.

The 10/90 problem is a clever name for enormous inequity: only 10% of the world's resources are used for 90% of health problems; in the author's previous survey of psychiatric journals, only 6% arose from regions accounting for over 90% of the population.

Science has a WEIRD problem...but like, actually. this not even accounting for gender or age

This study selected the highest impact general purpose medical journals, of all issues in one calendar year (either 2000 or 1999), and examined authorship (by institutional affiliation) and the methods, to ascertain the geographic origin of data.

Some notable variations in the regional data: 2 countries (Japan and Israel) contribute a 5th of the RoW-published literature, while China and India combined (the two most populous countries in the world) contribute a total of 13%. Only 31% of the total articles were entirely independent RoW.

2.2 GENDER DISPARITIES

> "Although there are more female than male undergraduate [especially in "softer" scientific fields" and graduate students in many countries, there are relatively few female full professors, and gender inequalities in hiring, earning, funding, satisfaction and patenting persist."

Quantitition of gender disparities in measures of scholarly output and has been few and far between – "highly localized, mono-disciplinary, and dated"; they take little account of the rise in collaborative research

etc. Larivière et al.[14] analyzed the relationship between gender and research output (authorship), collaboration extent (co-authorships) and scientific impact of publications (citation count, according to the Web of Science); The authors analyzed >5 million research papers and reviews with more than 27 million involved authors, assigning gender using data from the Social Security database.

Web of science, of course, is an extremely flawed way to do this because it barely includes anything that isn't the US or UK. See the sections on citation factors and global publishing

Some results:

1. in the most productive cntries, all articles with women in dominant author positions receive fewer citations than those with men in the same position
    a) accentuated by domesticity [nationality-wise] - women benefit less from the extra citations accrued by international collaborations
2. globally, women account for <30% of fractionalized authorship, men are >70%
    a) 1:1.93 women:men first authorships
3. South America & Eastern Europe had best gender parity
    a) female authorship generally more prevalent in countries and/or states with lower output
4. **impact:** when a woman is in prominent position (sole authorship, first-author, last-author), paper attracts fewer citations; holds for national and international collaborations

There are, of course, major limitations, the biggest one being obvious – age has an enormous role to play. Many trends are likely not actually markers of overt discrimination, but rather that women aren't making it to the top ranks of sicence and thus are not in a position to be publishing or collaborating on the mst important papers.

Basically, this is quantitive numbers to back up what women have been saying for years – there are tall, tall hurdles to jump. In 17% of countries, active scientists are equally represented: but fewer than 6% Web of Science countries come even close to gender parity in # papers published.

West et al.[26] published an extremely similar paper in PLoS one the same year, without the global analysis component but with even more papers as part of the analysis. Their source was the JSTOR corpus, "a body of academic papers...spanning five centuries". They look at similar variables – authorship order and overall percentages. This includes the humanities research as well, which is interested.

with the mention that publication counts obviously are relevant in tenure *discussions, e.g. hiring e.g. perpetuating cycle*

Also, HUGE points for their methods and reproducibility, e.g. creating the gender browser and communicating with me about making that something to apply to individual libraries in reference managers. Secret part of my div that may or may not manifest depending on the cooperation of these authors

2.3 RESEARCH ACCESS & ASSESSMENT

2.3.1 *Global Citation Indices*

Wagner[24], in *Unseen Science: Scholarly Publication in the BRICs but not in the Web of Science*, examined representation in citation indices and found only 4% of developing countries journals were counted. Luckily, this isn't country specific – only 4% of journals in *any* country are indexed. Which is not so much an indictment of what countries get indexed, but of impact factors in general.

2.3.2 *effect of open access publishing* on *access*

What is the influence of publishing OA on research attention? It's greatest impact is the development of world participation.

> Across sub-fields, the impact of commercial online availability was positive, statistically significant, and on average 40% larger than the OA effect, suggesting that most researchers rely on institutional subscriptions.
>
> The influence of OA was more than twice as strong in the developing world but was less apparent in the very poorest countries where electronic access is limited (Fig. 1D).[7]

Good/bad/always more complicated

3 OPEN SCIENCE

Defining "open"

"Open science" is a big, vague, nebulous term. First, the short and sweet version:

> "Open means **anyone** can **freely access, use, modify, and share** [content] for **any purpose**."

The "free" in that definition is, of course, free as in freedom, not as in beer. The open science movement is closely affiliated with the free/libre open source software (FLOSS) movement, and as such, there's a large overlap in terminology. Some preemptive clarification:

> "The terminology of and factions within this movement are complex, but, in short, "free software" tends to be associated with the ideology of freedom, "open source" with the openness of the development process, and "libre" with those concerned about confusion from the previous two. FOSS/FLOSS are used as monikers to refer to all of these meanings." (Reagle [20])

The open science movement's unifying[1] principle manifests with 3 (or 4, or 6, depending on who you ask) areas of interest:

1. open access - namely, to full-text published papers and research results
2. open data - publishing raw data pre- or concurrently with paper publication
3. open research - everything else, including, but not limited to:
    a) open code distribution - code for analyses, model generation, etc. should be hosted somewhere accessible
    b) open lab notebooks - tracing the entire research process with all dead ends and kinks included

There's also a hundred other subcategories that fall under the umbrella; new systems of distributed, ongoing, or otherwise "open" peer review or community discussion of publications, like the work at PubPeer, billed as an "online journal club".More examples here: Readcube/-Mendeley, collaborative reading sofware So open science is frustratingly broad and inconsistent, just like any other community. But there are some commonalities in intent and goals, and from that some general open science values can be dissected.

3.1 VALUE(S)

I think open science is really interesting as a BIG IDEA, largely because of its ties to the free and open source software movement, and specifically

1 unifying isn't actually the right word here – single shared point? overlap? lots of smaller movements all agreeing on this one

in the realm of community-driven goals. A lot more analytical work has been done on FLOSS sociological values than the narrower and newer niche of OS, so I draw largely from that.

In the FLOSS movement, there's a sharp ideological divide between the free/libre and the open licenses. Advocates of the libre licensing model list many advantages, but their main focus is libre software as a social imperative. User freedom (or their conception of it) is paramount. Open source, on the other hand, was created and remains in an explicit attempt to side-step the social values and ideological connotations of the term "free software", as laid out in the GNU General Public License (GPL). It instead has a narrow focus on access and production of source code - the 'practical' benefits of distributed production.

Bearing that distinction in mind, trivial as it initially seems, I think the usage of *open* in open science (OS) is a valuable point of entry into the ambivalent moral aspects of open science. Lots of proponents of OS either come from and/or explicitly draw from the F/LOSS movement, but the chosen movement nomenclature is "open". The same disavowal (or maybe just lack of acknowledgment) of social values seen in open source is apparent in a lot of the open science movement. It's not about science helping (or empowering) people, it's about doing "better" science – more reproducible, more reliable, more powerful (disruptive, even!). Open science is defined almost entirely by the *mechanisms*, in the same way open source is *just* focused on production. Even projects that pitch themselves as a place for citizen scientists can be construed as just a way to shift labor from cheap graduate students to even cheaper laypeople.

A lot of the following ideas draw heavily on analyses of the FLOSS movement, because that's where work has been done to some extent. "Open science" isn't nearly as widely talked about or analyzed.

UNSORTED [VALUE/D]TOPICS

3.1.1 *Lineages of open (science)*

> "The most common narrative about open science tells us that, once upon a time, science was an ethical enterprise: sharing, equality, disinterest and the common good drove the everyday work of scientists. Then evil corporations entered science and changed the rules of the game, patenting life, enclosing the commons, and eventually destroying the willingness to share data, information, and knowledge. But today, so the story goes, we have new tools that together with the old open science spirit an be used to rebel against evil, defeat it and allow scientific knowledge to flow freely again. These tools are open source and open access science, and they can be used to tear down the barriers to the access of scientific knowledge." (Delfanti, p. 5)

Open science rhetoric draws on a mystical past where information flowed free ("In the 17th century, journal publication *was* open science!"), and in so doing, constructs a seamless narrative where open science is part of every major discovery since Newton. Or whoever, pick your scientist. The construction of an illustrious history lends legitimacy to the moral appeal of the movement.

3.1.2 *Public image management*

Science has an intimate relationship with the media, and both parties use each other as a tool for various goals. The media gets a reputable scientist figure to bolster their claims; the scientist gets a public venue to couch their ideas or goals in objective-but-positive ways. Open science rhetoric is easy to use for both purposes.

Delfanti, in 2013, published "Biohackers: The Politics of Open Science".[6] It lies at the "the intersection of digital cultures, science communication and science and technology studies," a grouping that bears no little similarity to my own interests. His treatment of scientists and their public image management focusses on:

1. The J. Craig Venter Institute and J. Craig Venter himself, representing venture capitalists and open science for monetary and prestige
2. Ilaria Capua, a vetinarian virologist in Italy, who during the 2006 global avian influenza crisis, pushed the WHO through public shaming into changing their data policies to an open access model to better combat the disease
3. "DIYBio", a loose network of homegrown biologists.

Both Venter and Capua used publications in both prestigious journals and in more public forums (*Scientific American*, *The New York Times*) as a way to get the public involved in their work and on their side; public pressure, as created by and/or relayed by the media, was influential in both their success stories. The open science narrative was a tool in both of their toolkits used for different purposes and different effects.

citations here for when I find them

3.1.3 *Corporate uses of open science*

Open science, by intent, can be used by anybody for anything.

4

SEROTONIN, TRANSCRIPTION FACTORS, AND DIFFERENTIATION

"every biological organism is inherently individual"

But now for some "real" science.

4.1 WHY SEROTONIN?

Serotonin is 5-hydroxytryptamine (5-HT), a monoamine neurotransmitter binding 14 classes of receptors, all but one of which are G-protein coupled receptors (GPCRs). With receptors distributed across most parts of the brain, nearly every basic central nervous system (CNS) function, including mood, cognition, sleep, pain, motor function and endocrine secretion, is in some part modulated by serotonin signalling. As such, disruptions in serotonergic transmission is implicated in many psychological diseases (eg schizophrenia etc) and their corresponding pharmaceutical treatments.[15]

Model systems for serotonergic signalling are fundamental to therapeutic drug design and development, and in the case of hallucinogenic drugs, present a potential method to link molecular and sub-cellular processes to cognition and thought.

obviously hallucinogens are what I want to write abut but it's very far away from what I'm doing in lab, so not clear on how they'll get in yet. This section is really just a placeholder at the moment.

4.2 MODEL SYSTEMS

4.2.1 *why model systems are great!*

- exclusion of external elements
- isolated cell type
- controlled enviro
- genetic manip
- specific cell. manipulations
- support cells (microglia, astrocytes, etc)

*Bea thought these were important to discuss, but I'm not convinced I *need* to explain why model systems are useful to normal science. Normal in the Kuhn sense, obviously*

4.2.2 *current options*

Ideally, of course, one uses primary neuron cultures to study signalling – but those are expensive and hard to maintain.

–> other options? Haven't researched this yet mostly.

conclusion Thus, differentation of fast-growing and easy to maintain cells, that nonetheless express a relatively fully functional GPCR signalling intracellular network is an alternate model for us.

The available cell line to me is P19 stem cells, which are known to differentiate into relatively poorly-characterized neuron-like cells with the use of retinoic acid. The trick is to direct expression towards serotonergic neurons instead of *just* neurons. So how can we manipulate the P19 stem cells earlier in the process? We can (hopefully) set cell fate early on via expression of important transcription factors in serotonergic differentiation, and then allow cells to develop serotonin-receptor GPCR machinery relatively normally.

as far as cancerous, genetically manipulated, and traumatized rat cells can be "normal"

4.3 P19S

P19s are derived from rat embryonal teratocarcinoma cells. They retain pluripotency under normal cell culture conditions, and upon application of retinoic acid (RA) differentiate into CNS cells, including glia, neurons, and fibroblast like cells.

> "P19s have valuable characteristics– they are immortal, allowing the creation of "almost unlimited amounts of material for analysis, and easy to grow and maintain as undifferentiated cells, but can also be efficiently induced to differentiate by manipulation of culture conditions. "[3]
>
> The P19 embryonic carcinoma cell line has proved to be a particularly tractable system for studying neuron and glia differentiation. P19 cells are pluripotent and can be induced to differentiate into derivatives of all three germ layers: endoderm, mesoderm and ectoderm, depending on the nature of chemical inducers and the culture conditions (Runnicki and McBruney, 1987). After treatment with high concentrations of retinoic acid (RA) and aggregation, P19 cells can differentiate into neurons, glia and fibroblast-like cells (Jones-Villeneuve et al., 1982).
>
> RA has also been implicated in the development of vertebrate nervous system in vivo. RA is involved in the stimulation of axon outgrowth, the migration of neural crest cells and the specification of rostrocaudal position in the developing central nervous system (Maden and Holder, 1992). Studies of RA-induced P19 neural differ- entiation have led to the discovery of a number of genes that are important for neural development in vivo[25]

4.4 THE 5-HT SYSTEM

The 5-HT system is one of the most complex projection networks in the CNS. It has three descending efferents to the spinal cord, while the B5-B9 neurons project via 5 different routes to almost every region of the CNS. This large network means serotonin signalling not only transmits information, but plays a large role in *modulating* the rest of brain function.

Brain anatomy.
5-HT *actual* distribution

Genes	Expression	5–HT defects	KO lethality	5–HT-specific TF
Nkx2.2	ventricular zone	100% except in r1 P0	P0	lost except in r1
Mash1	ventricular zone	Almost 100%	P0	all lost
Gata2	VZ, postmitotic	100%	E10-12.5	all lost
Lmx1b	Postmitotic	100%	P0	all lost
Pet1	Postmitotic	70%	mostly viable	unknown
Gata3	Postmitotic	mostly in caudal	E11.5-13.5	unknown

Table 1: Summary of the phenotype of knockout mice lacking individual transcription factor in 5–HT neurons. (from Chen and Ding)

4.4.1 *embryonic development*

Stem cells = embryonic cells; hence, knowing and examining the embryonic precursors to 5-HT neurons and then mimicking them => 5-HT neurons in culture

During embryonic development, the different networks of 5-HT neurons are much less distinct. In mice, they're some of the earliest generated neurons, appearing between E10.5 and E12.5, starting in the rostral regions along the brainstem axis. By E12.5, almost all of the 5-HT neuron classes are present. Induction and specification of diverse neurons, and specifically 5-HT neurons, requires a set of signaling molecules, converted into a combinatorial transcriptional code.

4.5 TRANSCRIPTION FACTORS IN 5-HT DIFFERENTIATION

4.5.1 *in 5-HT progenitor cells*

more neuroanatomy! more signalling pathways!

Nkx2.2

Nkx2.2! (**Nkx2.2!**) is a homeodomain-containing transcription fator that specifies the ventral cell type in response tosonic hedgehog (Shh) signals in the spinal cord and hindbrain. Expression of *Nkx2.2* ceases as soon as 5-HT cells become post-mitotic. Upstream of *Phox2b*, *Nkx2.2* plays a role in

1. earliest transcription factor required for 5-HT specifications
2. dispensable in r1 5-HT; Nkx2.2 KO neurons derived from r1 are unaffected
3. in the absence of Phox2b, adopts a default pathway to promote 5-HT fate

Ascl1/Mash1 *

expression patterns & time course

Mash1 is the mouse, human, and rat basic helix-loop-helix protein structural motif (bHLH) homologue of Achaete-scute homolog 1 (Ascl1), first discovered and explored in *Drosophila* as a pro-neural gene.

It's a key fate determinant for many neuron types during fetal and adult neurogenesis. In the embryonic hindbrain, it's the only known

pro-neural gene expressed in the domain of 5-HT progenitor cells, and is co-expressed with **Nkx2.2!** during vMN and 5-HT production.

Mash1 KO mice do not effectively product 5-HT neurons. visceral motor neurons (vMNs), which derive from the same set of cells, are produced normally, but without Mash1, none of the normal post-mitotic 5-HT transcription factors express. Likely, this is due to the loss of Notch signalling that ordinarily leads to 5-HT neurogenesis.

Mash1 possesses specific 5-HT characteristics; cannot be replaced by other pro-neural bHLH factors. At the same time, it is not *sufficient* to induce 5-HT differentiation; it requires cofactors, like *Nkx2.2*.

4.5.2 *in the ventricular zone & post-mitotic 5-HT neurons*

Gata2, Gata3

1. Members of the GATA family containing zinc-fingers which bind to core (A/T)GATA(A/G)
2. Gata2 precedes -3;
    a) E9.0 in r4 and transiently in r2
    b) E10.5 expanded to all rhombomeres and detected in VZ progenitor cells and in post-mitotic cells
3. Gata2 KO:
    a) severe anemia; death between E10 and E11
    b) defects in neurogenesis generally; early lethality precludes 5-HT specific examination
    c) *in vitro* test; KO tissues lack all 5-HT neurons, even in presence of Gata3
4. Gata2 affects different 5-HT cluster development differently. It is necessary and sufficient in R1 neurons, and capable of inducing other 5-HT specific TFs in r1.
    a) capable of inducing other 5-HT specific TFs in r1
    b) necessary and sufficient in r1
    c) necessary but not sufficient
5. Gata3 - relevant in caudal development of raphe nuclei
6. conflicting reports of Gata2 + Gata3 interactions
    a) Gata3 operates either independently or downstream of Gata2 and Lmx1b
    b) poorly understand epistatic relationships

5

OPEN SCIENCE & SEROTONIN: CASE STUDY

I keep an open lab notebook. So what?

Some thoughts: Since being open is *not* the same as being accessible, transparent, or even useful (re: Slee, *Notes against openness*); anything that wants to accomplish those goals needs a lot more thought and planning. I think open notebooks are only a small component of what sharing procedures is; said differently, "notebooks" need redefinining. The open, accessible, etc. notebook online is identical in terms of words, graphics, etc. to my paper notebook – in many instances, it's even better. It is not, however, *complete*. No one would ever look at my paper notebook and be able to coherently trace protocols as they evolved; at least, not without my help.

I think a more ideal situation is *not* a transfer of paper to electronic. Rather, multiple layers of publication - namely, including methods. Real protocols, but protocols as you might write them out for someone in your lab running an experiment for you, instead of bite-sized uber-simplified "Procedures were performed as described previously."

That would be paired with a record of why changes were made in protocols, in the form of annotations linking back to lab notebook entries on various steps. e.g. "Annealing temperature is 59° based on the [date] gradient PCR and subsequent cloning attempts of [date_1], [date_2]"

6 CRITICAL NEUROSCIENCE

6.1 NOTES ON A CRITICAL ANALYSIS

@ Gendered innovations, Sandra Harding talks about problems of gender in science. They come in the form of either not *enough* attention to gender (seatbelts, heart attacks, stem cells) or *too much* attention to gender

6.2 HISTORICAL NEUROSCIENCE

"Neuroscience" as a discipline constructs a history tied to Galen and Aristotle and ancient Sumerian hieroglyphs, but in it's current state is a product of a reductionist "molecular gaze".[1]

6.3 QUESTIONS I WANT TO ASK (AND ANSWER?)

6.3.1 *Stem Cells and Gender*

Stem cells: They have a "sex", in the sense that there is a chromosomal makeup, and it matters. See Ray et al. and Gendered Innovations.

6.3.2 *Molecular and genetic reductionism*

generally a trend in the sciences, not limited to biomedical.

Somewhat inherent to "neuroscience", since the ultimate goal is to reduce function/cognition to a set of circuits/cells/meaningful small and completely circumscribed/understood units.

Where does it come from?

What goals and how does reductionism accomplish for us? What is good and not good about applications to neuro? Can and should cell studies be used to "answer" or explore questions about cognition? What do we lose when we "solve" disease in vitro? /graffito A sensible research strategy (isolationism/reducitonism) becomes a metaphysical commitment to a system, where the system is reality. For us, cell lines are indicative of some reality. It's plausible that scientists themselves know their work to be missing enormous sweeps of holistic knowledge, but any written work rarely acknowledges it. Grants and papers imply and argue, point-blank that molecular work is the answer to XYZ – and not just the answer, but the problem to be studied as well.

Personalized medicine; or personalized neuroscience is still a way of reducing the individual to the cellular and genomic information, without accounting for personhood. Personalized medicine in its current information is the exact opposite of feminist medicine.

6.4 BABY CRITICAL THOUGHTS

Neuroscience is essentially, and intentionally, interdisciplinary. Choudhury and Slaby, in the introduction to *Critical Neuroscience* propose

"interdisciplinary" as a code word for scientism; and neuroscience, the field, was deliberately named, funded, and institutionalized to lie at the intersection of complementary disciplines.[1]

Neuroscience is a scientific approach to a centuries old question of consciousness and/or what makes us human promising, at long last, success. At the very least, that's what the most high-profile members of the neuroscientific community imply.

I think relevant is Gorelick's brief discussion of indigenous sciences as a process, and specifically the proposal that science-as-a-process is consistent with a verb-based language. "A bay" is English; the verb-based version is "to be a bay", which is not inanimate but moves in dynamic relationships with the wind and shoreline and other parts of the world. To be human or conscious or think is to have a similar dynamic and evolving relationship. On a very basic level, to be alive is to be in concert with the environment. #epigenetics.

So cellular and molecular neuroscience is missing a great deal of things.

Situating the brain/cognition w/in a culture is a trend - epigenetics as "from soma to society". But this also creates new "at rick" populations, incorporating social culture into scientific dogma. –[12,17]

See the "gene for asthma" for why this is obviously wildly incorrect.

Big narratives of simplicity – simple simple simple, so we can understand. Many simple pieces to make a big complex system. Hoes this work? Eh, probably not. But what does it do when it doesn't work? How does it go wrong? Or how does it go right?

There's some arguments about neoliberalism and reductionism. I hear a lot of usage of "nature" and "science" to support some sort of status quo, of "free market forces"

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