Plausible Fiction: Tending Actualizes Potential

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Outline

Plausible Fiction

Plausible Fiction (PF) consists of four rules and one mechanism. Rules:

- It starts with the present moment, as it is, with minimal distortion.
- It ends with a future the author sees as good, or at least open.
- It is plausible the whole way, given how physics, society, etc. work.
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- Gap filling is factoring big theorems into simpler lemmas to prove.
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What would we write PF about? Whatever we care about.

Care tends to actualize potential

Care:

- Care words: *matters*, *useful*, *important*, *worry*, *problem*, *want*, *value*.
- Pirsig: external quality reflects internal care.
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Tends to:

- Empirically, how do we *tend* to accomplish stuff? Caring tends to work
- How does care work? By tending, as to a garden. Staying in touch.
- To care is to attend, to pay attention. We tend *in order to* AP.

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- The actual is what is here, real. Actions speak louder than words.
- Self actualization, becoming all you can be, reaching your potential.

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Potential:

- Potential is possibility—what could become or be potent.
- This baby, this genius kid from India, this algorithm, this experience.
- What could be, if only...? This is what we care about.

Tending to what matters, what can we count on?

To "count on" something means to trust or rely on it.

- In this talk, you can count on the math being accurate.
- Puns and word origins highlight deeper or multi-layered meanings.
- If something is labeled as fiction, consider it a proposal not a certainty.

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I propose plausible fiction as a narrative tool for potential actualization.

- Plausible fiction may help us explain how things come to be.
- We can aim for good futures by relying on increasingly plausible plans.

Plan for the talk

The plan for the rest of the talk is as follows:

- Consider Smith's approach to origins of life in our context,
- Discuss the concept of *working language*,
- Propose a way of accounting for potential actualization,
- Question the ethics of plausible fiction, and
- Conclude with a summary.

Outline

Lightning, hurricanes, and life

Eric Smith's 2007 talk, "Inevitable Life?", lays out a theory for life's origin.

- It is a *metabolism first*, rather than control (RNA) first, theory.
- It is a hell-theory (hot depths) rather than heavens-theory (sun god).
- The theory is formulated around the reverse TCA cycle.
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Smith likens early life to lightning strikes or hurricanes.

- With lightning, there's a potential difference between sky and ground.
- Lightning actualizes that potential by creating a spark.
- With hurricanes, there's a temp're difference between sky and ocean.
- The eye of the hurricane is a tube that rushes hot air up.
- In both cases, the difference would otherwise be more slowly resolved.

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Smith says that early life was another such case.

- Deep sea hydroth'mal vents emit CH_4 and CO_2, high-energy molecules.
- There's a energy-emitting reaction $CH_4 + CO_2 \rightarrow 2CO + 2H_2$.
- Life was the simplest "chemistry lab" that could catalyze this reaction.

Contextualizing care

From this point of view, what is life?

- Early life contains & orders the catalysts to perform the above reaction.
- As it evolves, life is able to perform other energy-emitting reactions.
- In other words, organisms organize processes for actualizing potential.

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From origins to ethics: our ancestors have always been carers.

- This origin story says actualizing potential has always been the goal.
- But it extends all the way to our understanding of care today.
- Care isn't alw's benevolent: Tyson cared about destruction in the ring.
- When caring for a baby, a garden, or any other project,...
- ...we see some potential and we find it important to actualize it.
  - Hardy saw pot'l in Ramanujan and worked hard to actualize it.
  - Using a smartphone to hammer nails feels bad: potential misused.
  - This explains why slavery is wrong: human potential misused.

Recombination and coordination in life

Accomplishing a given task (actualize some potential) may require timing.

- Leaving steps idle for too long increases the risk of failure..
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- They need to attend in order to carry out the choreography.
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- Its material form is recombinant (Theseus), though at diff't timescales.
- In ecosystems, the overall metabolic process recombines in new forms.
- Life has evolved more complex processes for actualizing more potential.
- Human collectives also form, dissolve, recombine actu'zing shared pot'l.

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Plausible fiction is designed to facilitate recombinant collaboration.

- Collabor's come & go, providing stepping stones toward shared goals.
- It uses language and narrative as the driver. Will that work?

Outline

What is working language?

Language works in the sense of basic physics: it directs energy.

- If I say "pass the salt," 10^{25} atoms move through space.
- What if someone says "there's a lot of oil underground in Oklahoma"?
  - This may inspire lots of different groups to collaborate to get it.
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The required coordination is impressive and certainly actualizes potential.

- This coordination could not happen without language to guide it.
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There are other working languages; all evolve toward expressing intentions.

- DNA is working language: ACGT symbols code for cellular chemistry.
- Computer programming languages do a lot of work in the world.
- The codon transl'n ($60 \to 20$) is info-th. optimal to minimize error.
- Prog. languages are constantly being refined to foreground intentions.

Accounting systems

Expressing ideas in a regulated language creates an *account*.

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- In trials, judges regulate how people account for their actions.
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What are the most system'c and trustworthy languages for such accounts?

Mathematics

I think of mathematical fields as crystalized accounting systems.

- Arithmetic accounts for the flow of quantities, as in finance.
- Hilbert spaces account for the states of elementary particles, as in QM.
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We want systematic accounting for potential actualization.

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- Carefully track the phenomena, articulate the structure, systematize.
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Category theory (CT) is the accounting system for interlocking structures.

- Mathematical definitions are composed of interlocking structures.
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- This makes analogies—similarities of structure—into formal objects.
- Lawvere called it *Conceptual Mathematics*, as opposed to quantitative.

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Note: I don't have a CT account of PA. This is all just plausible fiction.

Can plausible fiction work?

Let's take stock of some key words from where we have been...

- PF: starts now, ends well, plausible, understandable. Fill gaps!
- Care: it actualizes potential by tending.
- Life: carers that notice and actualize potential.
- Recombinant collaboration: parts join, labor together, and separate.
- Working language: language (ACGT, English, Rust) coordinates.
- Mathematics: crystalized, highly-regulated accounting systems work.

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...and get a sense of where we'll be going.

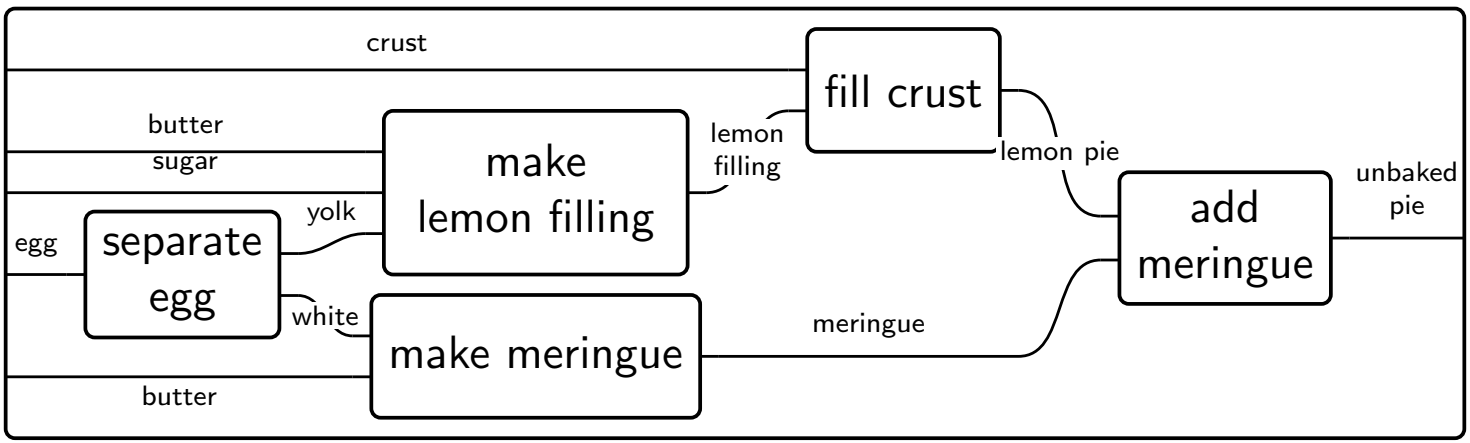
- We care about having a good (or at least an open) future.
- We want to know if plausible fiction can help us get there.
- So we will propose a mathematical account of how it *might* work.
- It's a *work in progress*, a plausible fiction with many gaps!
- Will this lead to good futures? We'll end by considering ethics.

Outline

Petri nets

A Petri net consists of two types of thing: *resources* and *transitions*.

- Each transition consists of two things: input and output resources.
- E.g. egg → [separate egg] → yolk, white is a transition.
- A Petri net may include many different resources and transitions.
- Usually resources are called places or species and drawn as circles.
- I'll draw resources as wires and transitions as boxes.



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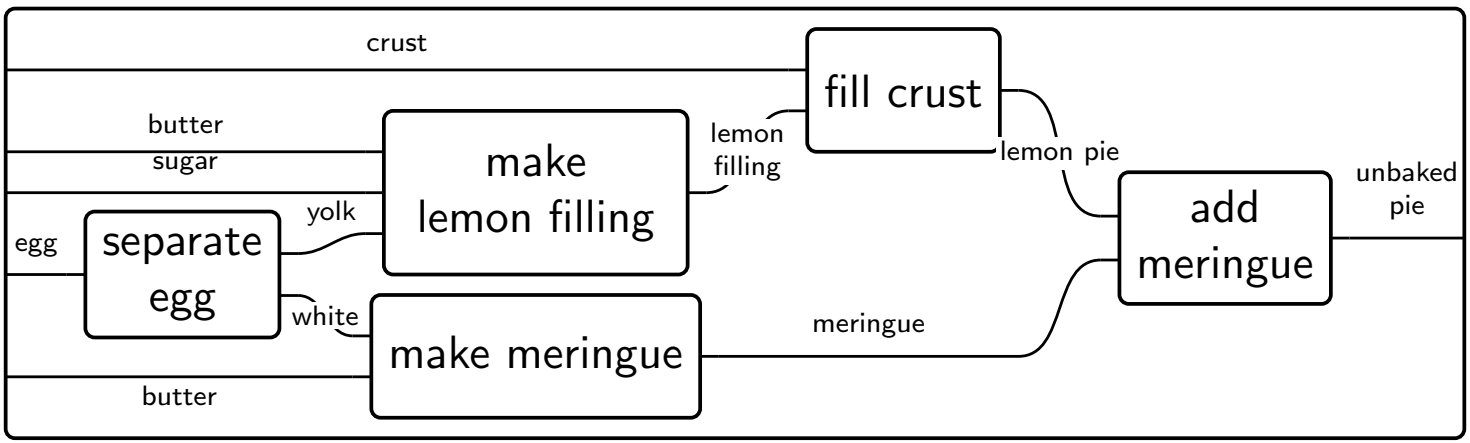

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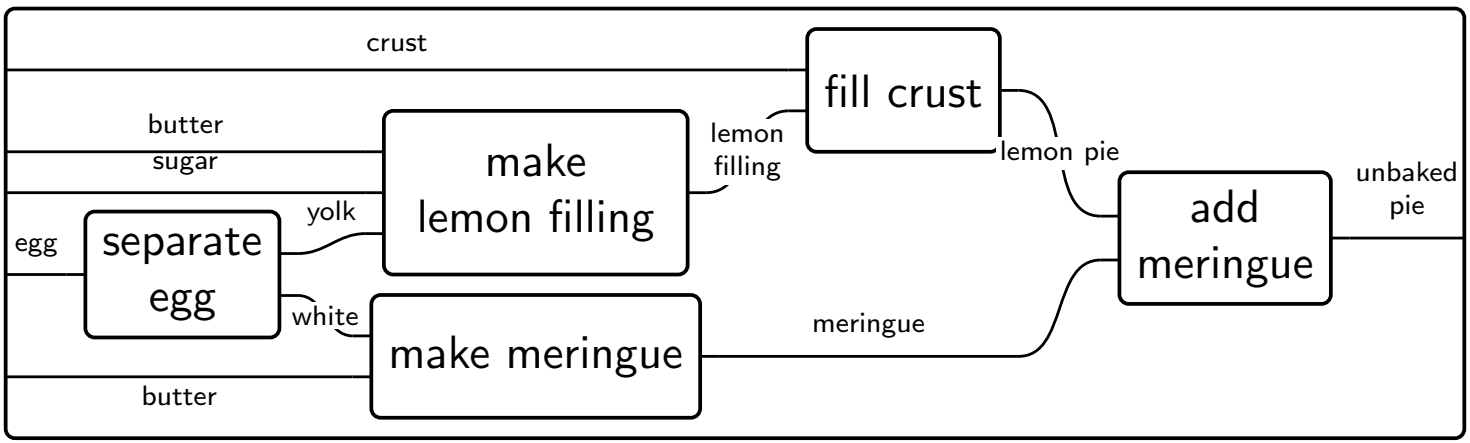

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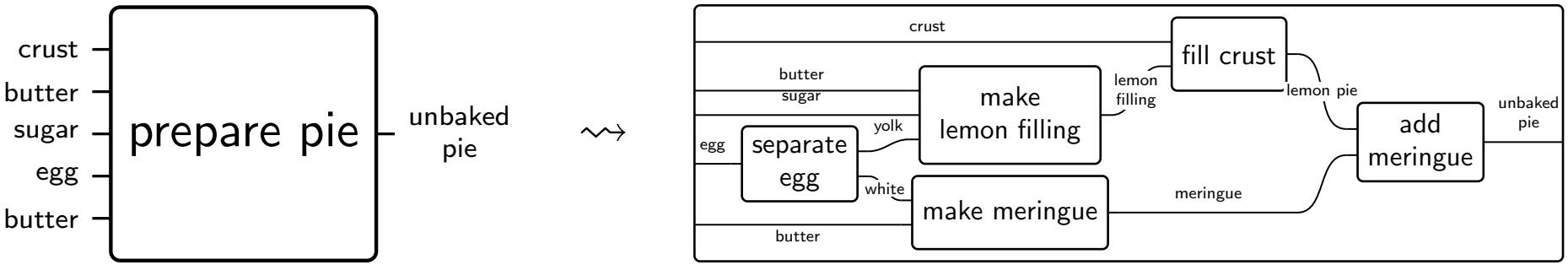
In CT, a Petri net is called a *signature* for a *sym. monoidal (SM) category*.

- Executions are precisely the morphisms in this SM category.

Operadic gap-filling

Imagine each wiring diagram as plausible fiction, each box as a gap.



- It's a plausible gap to say we can prepare pie with these resources.
- The wiring diagram is plausible fiction for how to fill that gap.
- It in turn leaves plenty of gaps: how do you make lemon filling?
- Collaborators can fill in those gaps with recipes (plausible fictions).

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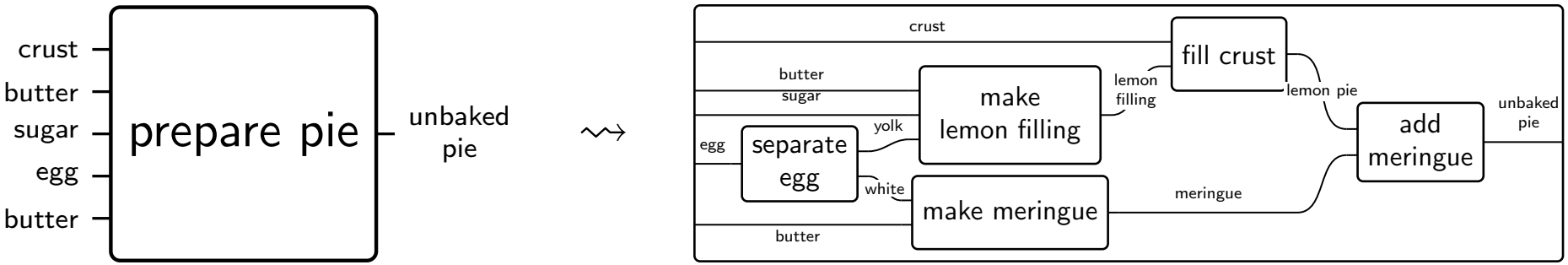

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Note the recursive nature of gap-filling.

- You can recursively dive down, arranging many boxes inside of one box.
- Or fill a box with an arrangement of 0 boxes, e.g.  , and it's done.
- This is all syntax—just boxes in boxes. Semantics are next slide.

Things like this are called *operads*; here we're showing the operad for SMCs.

- Perhaps plausible fiction is more general than SMCs, but still operadic.

Operad algebras

An operad $\mathcal{O}$ is (roughly) a syntax for gap filling.

- A gap G can be filled by an arr't $f : G_1, \ldots, G_k \to G$ of (smaller) gaps.
- We also saw that "pure wiring" (0-ary arrange'nts)  , can fill gaps.
- The rest is know-how: Alice knows how to fill the "separate egg" gap.

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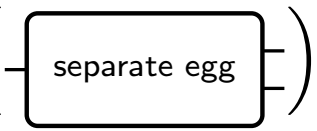
An operad functor (map) $M\colon \mathcal{O} \to \mathbf{Set}$ is called an $\mathcal{O}$-algebra.

- $M(G)$ tells us what can *actually* fill gap G, not just more gaps.
- E.g., $M\Big($ 

$\Big)$ is the set ways to separate egg.
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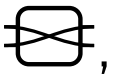
- We also saw that "pure wiring" (0-ary arrange'nts)  , can fill gaps.
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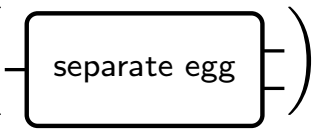
- E.g., $M\Big($  $\Big)$ is the set ways to separate egg.
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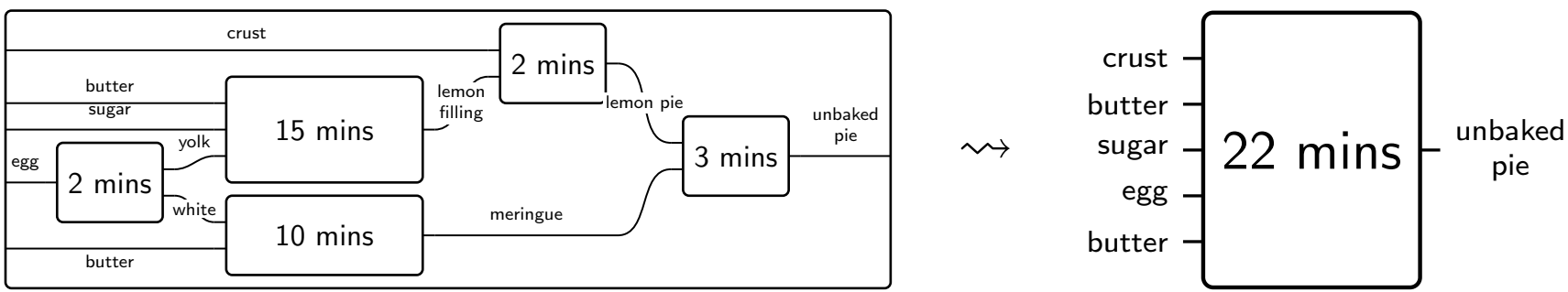
- ...taking in ways to fill gaps $G_1, \ldots, G_k$ and producing a way to fill G.

But we could have other sorts of algebras, i.e. other sorts of fillers.



A plausible platform for actualizing potential?

I'm proposing that operads may serve as a math foundation of gap-filling.

- This would give a crystalized accounting system for plausible fiction.
- From here it would be relatively easy to make a software platform.
  - For example, people could type in plausible fiction as text.
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Could it be abused? Does it lead to a "good future" in your estimation?

Outline

Sustainable care

Ethics is the theory of what we *ought* do, but (to me) ought is a care word.

- Ought points to what we most deeply care about, what matters most.
- Deep cares are those we keep even as surface cares change.
  - I care about eating a donut until I'm done, then I wish I hadn't.
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It's worthwhile to actively recognize and phase out unsustainable cares.

- PF can help us envision transitions to sustainable practices.
- By collaborating, we can accelerate the phasing-out process.

Karmic loops

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Soon, the system may hold us accountable for our own net contribution.

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- "Let's say that we were super successful and made robots brilliant."
- "Can you imagine a good future that includes brilliant robots?"
- A: "My go-to is a Wall-E world where robots help us scavenge."
  - I responded that this was an overall bad world.
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This suggests an ethical litmus test for project P:

- If we're successful at P, is it easier to imagine good or bad futures?
- If overall futures are worse for your self/family/community/world...
- ...then doing P is selling out / disloyal / unethical / self-cannibalizing.

Accounting for ourselves

Judith Butler said that morality is "giving an account of oneself".

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But we also need to account for our own sake, i.e. language is empowering.

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Ethics: sustainable care aligns with lasting good outcomes.

- Unsustainable care self-cannibalizes and reduces future potential.
- Let's seek sustainable care and collaborate on better, enduring futures.

Thank you for attending! Comments and questions welcome...