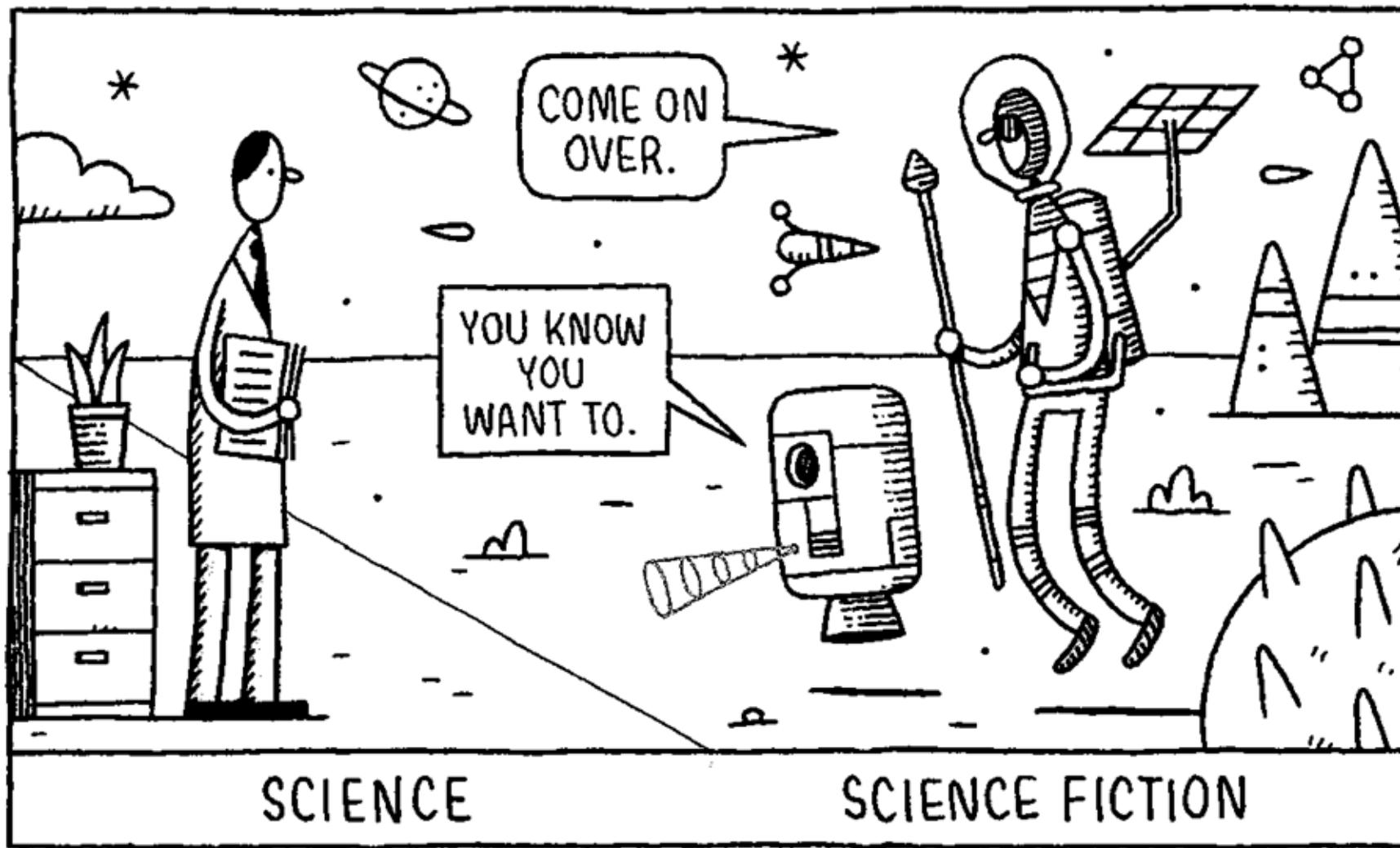


AUGMENTING IDEATION AND SENSEMAKING IN THE AGE OF LLMs

Concepts, Examples, and Opportunities from an HCI Perspective

as told by Gonzalo Ramos
goramos@microsoft.com

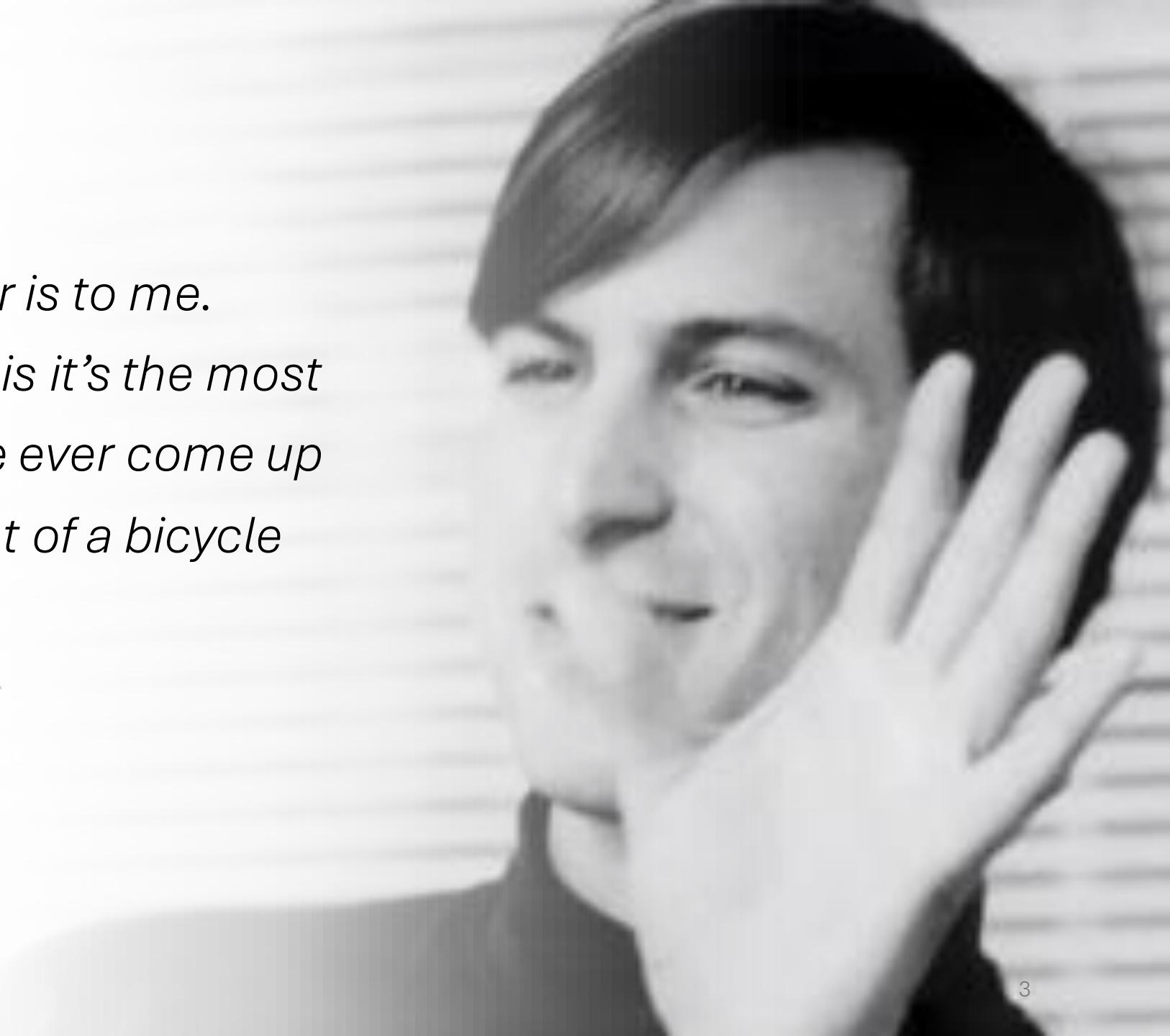


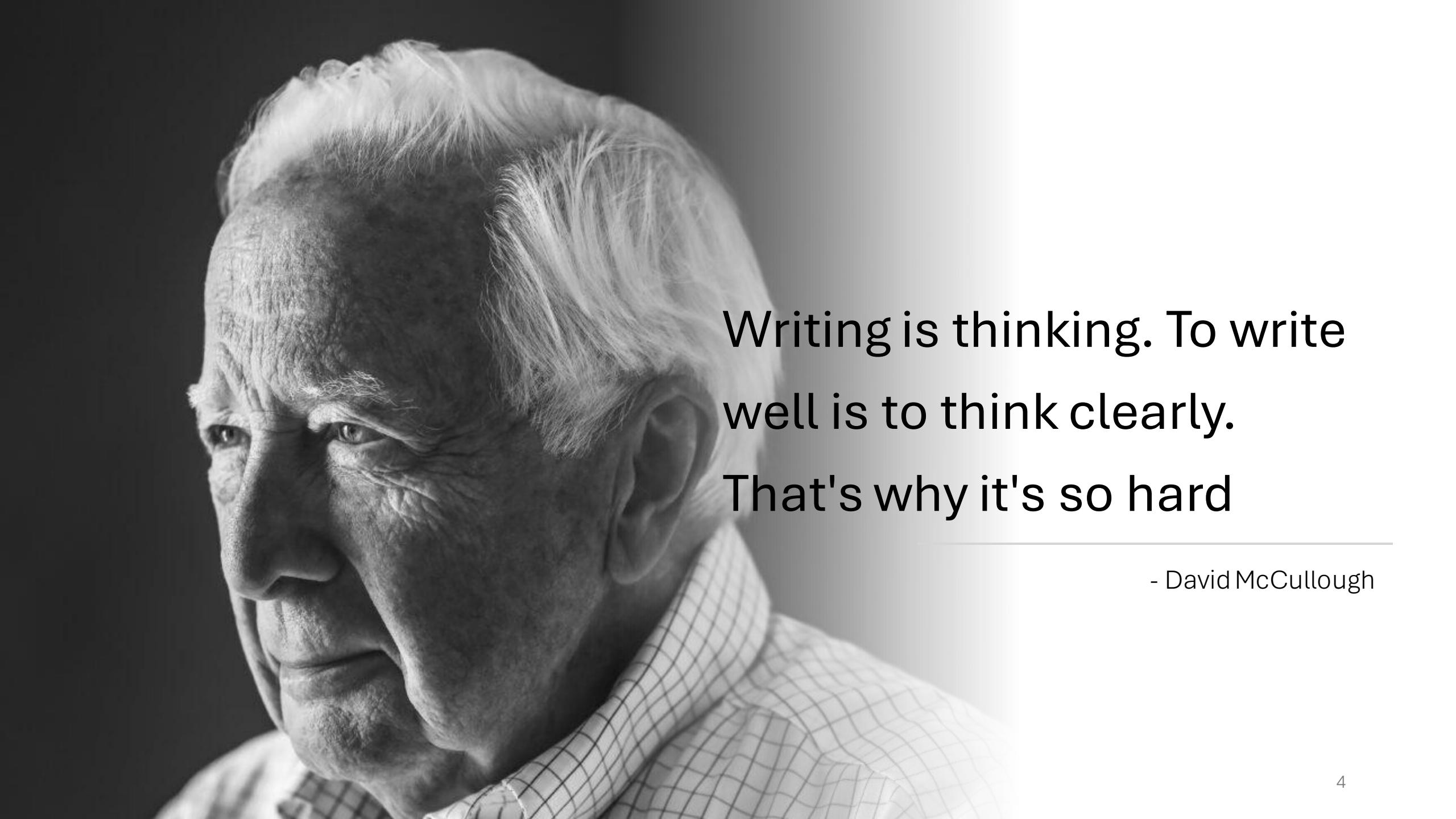
TOM GAULD for NEW SCIENTIST

[...] that's what a computer is to me.

What a computer is to me is it's the most remarkable tool that we've ever come up with, and it's the equivalent of a bicycle for our minds.

- Steve Jobs





Writing is thinking. To write
well is to think clearly.
That's why it's so hard

- David McCullough

IN THIS LECTURE...

- Frameworks to help us think about augmenting thinking
- Sensemaking & its augmentation opportunities
- Ideation / creativity & its augmentation opportunities
- Main takeaways and provocations

(with follow-up activities!)

ON THE DIFFERENT TYPES OF THINKING

(a non-exhaustive list)

Diverge

Reflect

Recall

Plan

Converge

...



DISTRIBUTED COGNITION

(a primer)

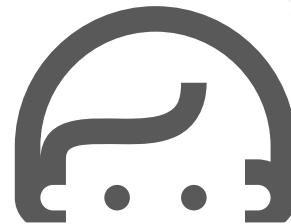
Cognition is distributed across people, artifacts & the environment.

Some key perspectives

- There are internal and external media
- Involve the propagation of states across participants
- Knowledge in these systems is resilient (redundant)

Hollan, J., Hutchins, E.L., & Kirsh, D. (2000). Distributed cognition: toward a new foundation for human-computer interaction research. ACM Trans. Comput. Hum. Interact., 7, 174-196.

Rogers, Y. (1997). A brief introduction to Distributed Cognition.



THE EXTENDED MIND

(a primer)

When external elements can become part of the cognitive system.

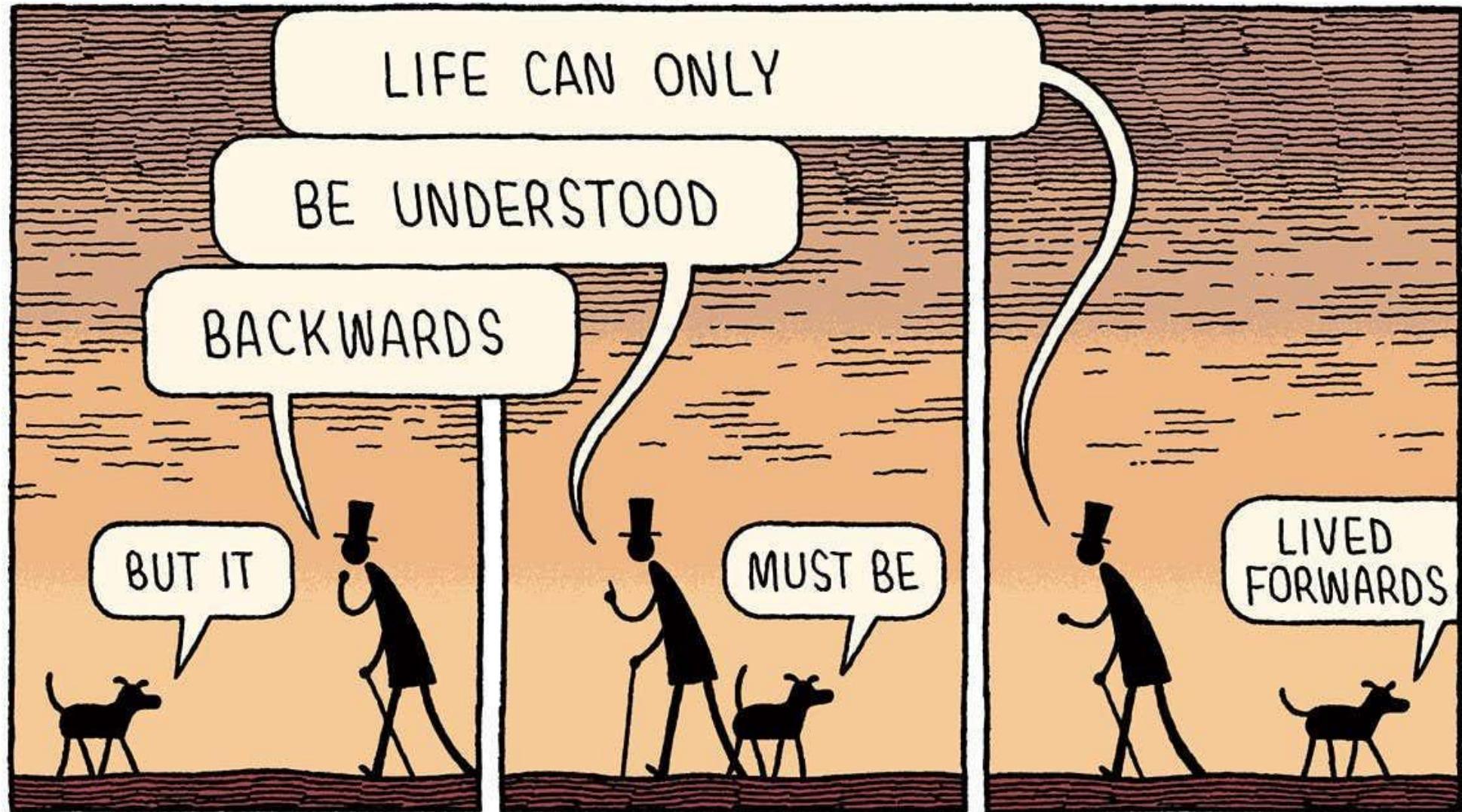
This happens when they...

- Are a constant and reliable presence.
- Are directly, easily available.
- Are automatically endorsed, trusted when accessed.
- Have been consciously endorsed in the past.





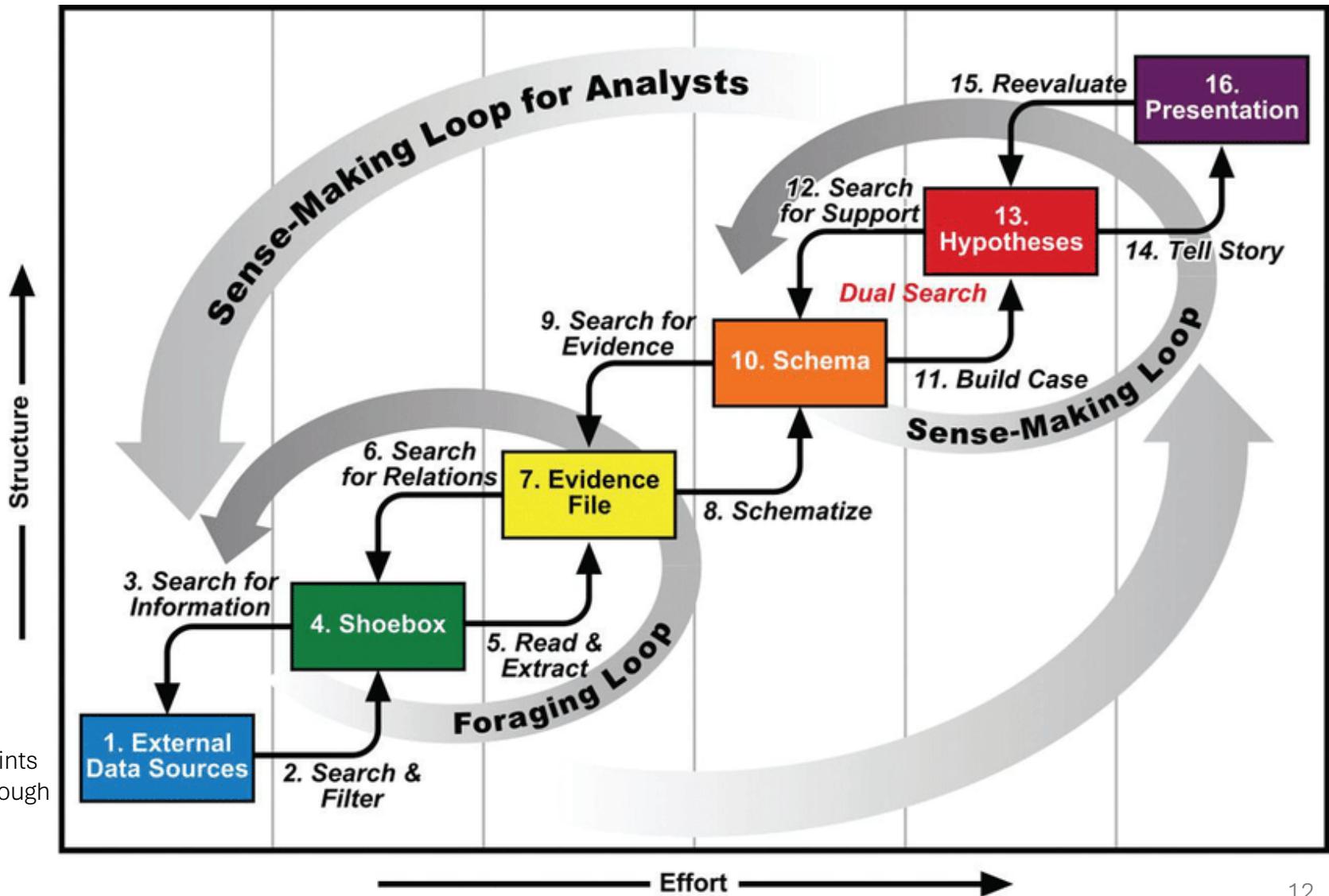
SØREN KIERKEGAARD, 1843



TOM GAULD for NEW SCIENTIST

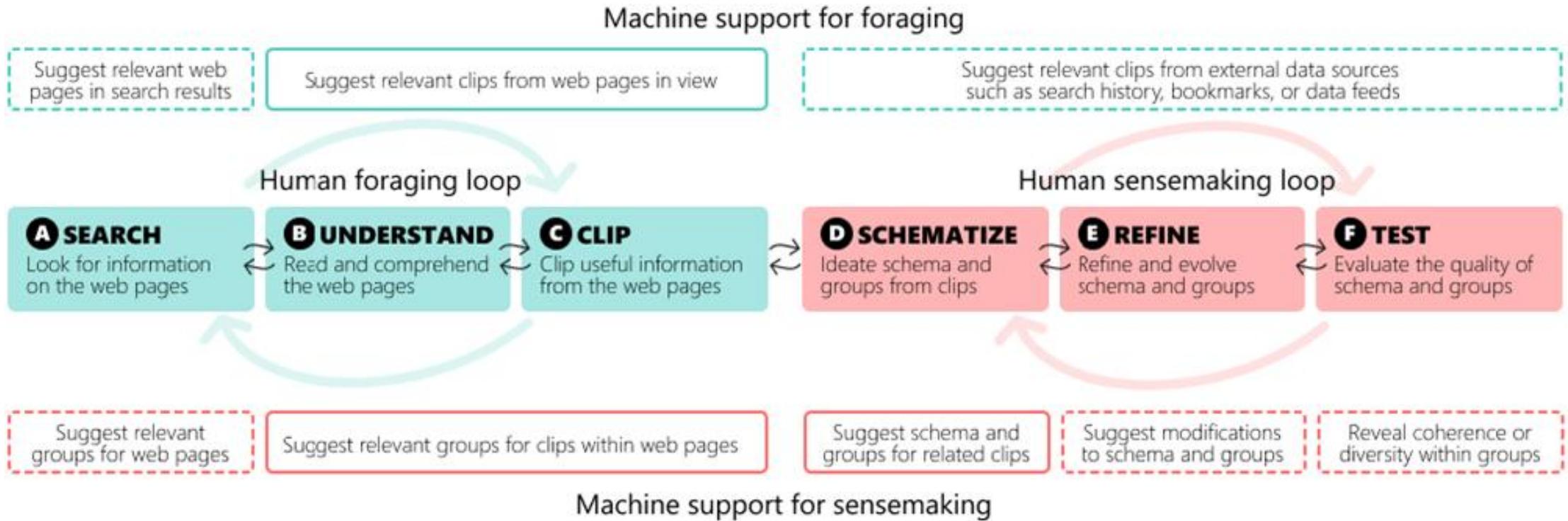
SENSEMAKING

A MAP OF SENSEMAKING



Pirolli, P., & Card, S. (2015). The Sensemaking Process and Leverage Points for Analyst Technology as Identified Through Cognitive Task Analysis.

SENSEMAKING: AUGMENTATION OPPORTUNITIES



Ramos, G.A., Rachatasumrit, N., Suh, J., Ng, R., & Meek, C. (2022). ForSense: Accelerating Online Research Through Sensemaking Integration and Machine Research Support. ACM Transactions on Interactive Intelligent Systems, 12, 1 - 23.

Clip

Select

History

Urgent - 100% success
Communication (urgent) or 100% from
prioritizing, tracking, and communicating.

Urgent - 100%

Communication (urgent)
Communication (urgent) or 100% from
prioritizing, tracking, and communicating.

Urgent - 100%

Materials

Communication (urgent) or 100% from
prioritizing, tracking, and communicating
Communication (urgent) or 100% from
prioritizing, tracking, and communicating.

Urgent - 100%

Communication (urgent) or 100% from
prioritizing, tracking, and communicating
Communication (urgent) or 100% from
prioritizing, tracking, and communicating.

Urgent - 100%

To urgent - the period until the due date
to urgent tasks is currently given by three
days, so that could become a concern.

Urgent - 100%

The user wants (urgent) 100% success
Communication (urgent) or 100% from
prioritizing, tracking, and communicating.

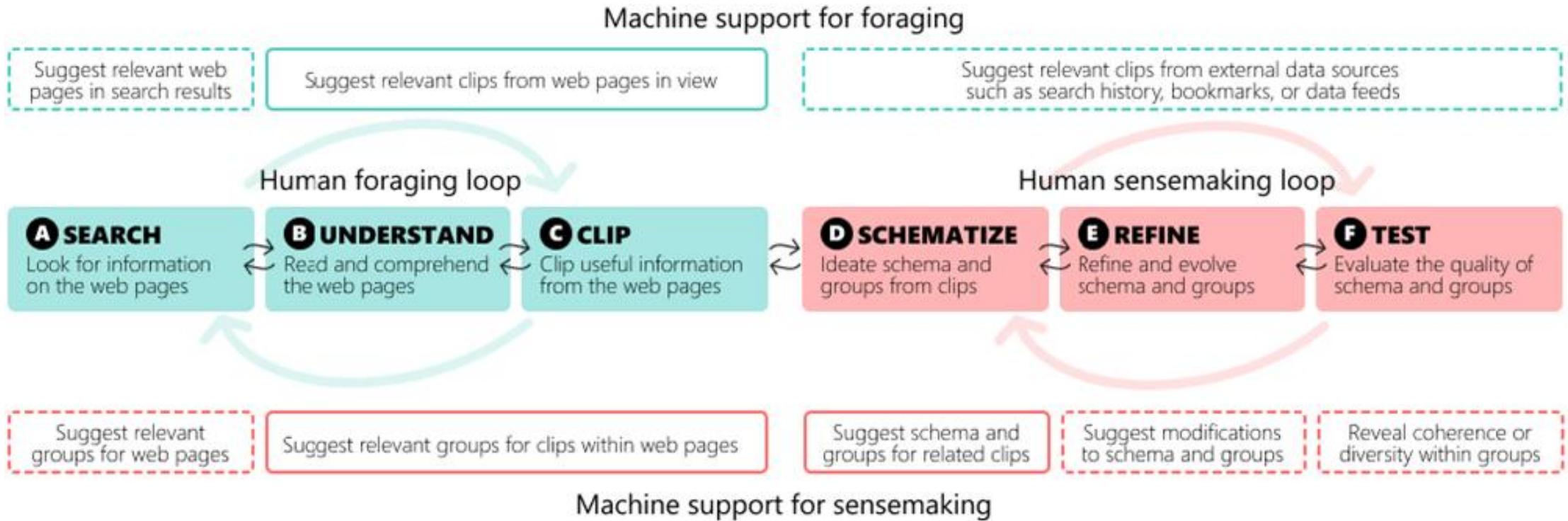
Urgent - 100%

Task assignment (urgent) Task assigned from Urgent -
100% success (urgent) 100% from prioritizing,
tracking, and communicating.

Urgent - 100%

The user also has the need to make sure the
communication (urgent) response communication
or the same will come. This leads to
Communication (urgent) - Success

SENSEMAKING: AUGMENTATION OPPORTUNITIES



Ramos, G.A., Rachatasumrit, N., Suh, J., Ng, R., & Meek, C. (2022). ForSense: Accelerating Online Research Through Sensemaking Integration and Machine Research Support. ACM Transactions on Interactive Intelligent Systems, 12, 1 - 23.

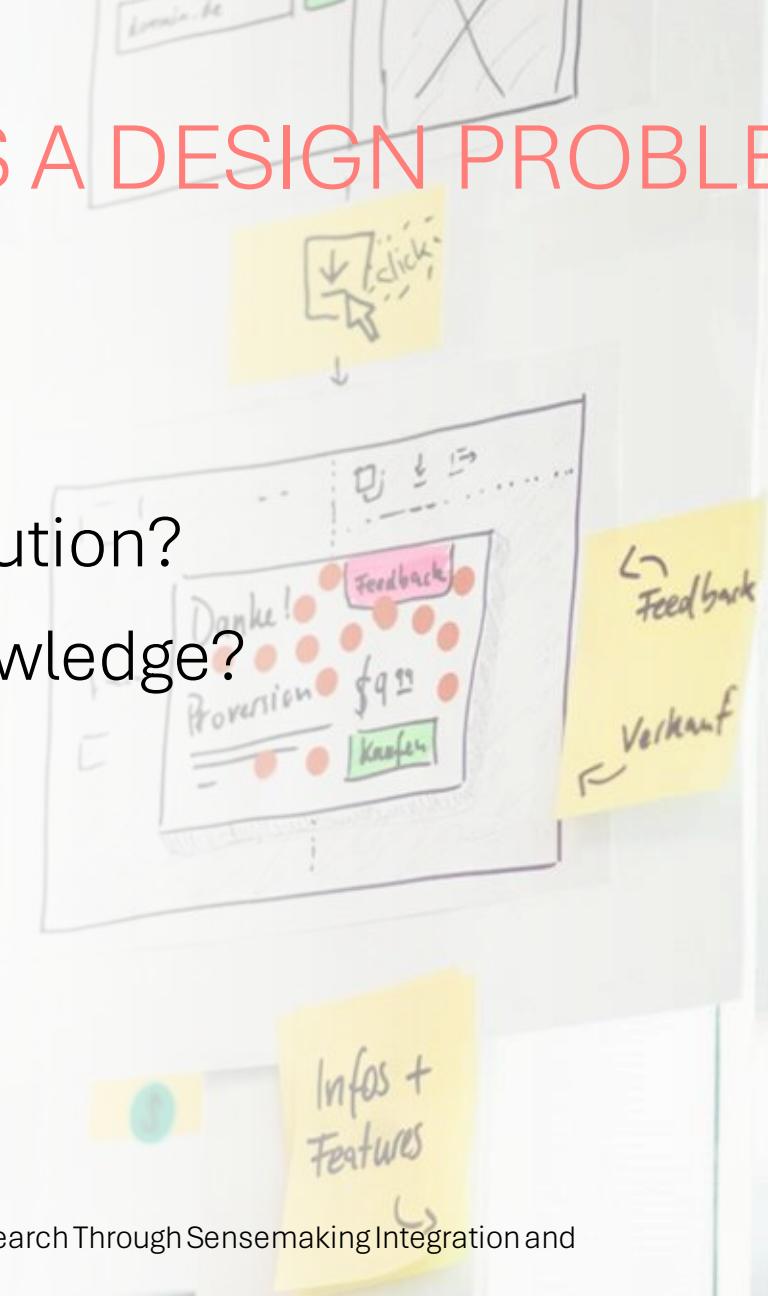
SENSEMAKING AUGMENTATION AS A DESIGN PROBLEM

How might we...

- Balance people & machine agencies?
- Reduce the gulfs of evaluation and execution?
- Support people's willingness to give knowledge?

We...

- Complement, do not replace
- Blend in the flow, do not break it
- Error can be a feature, not a bug

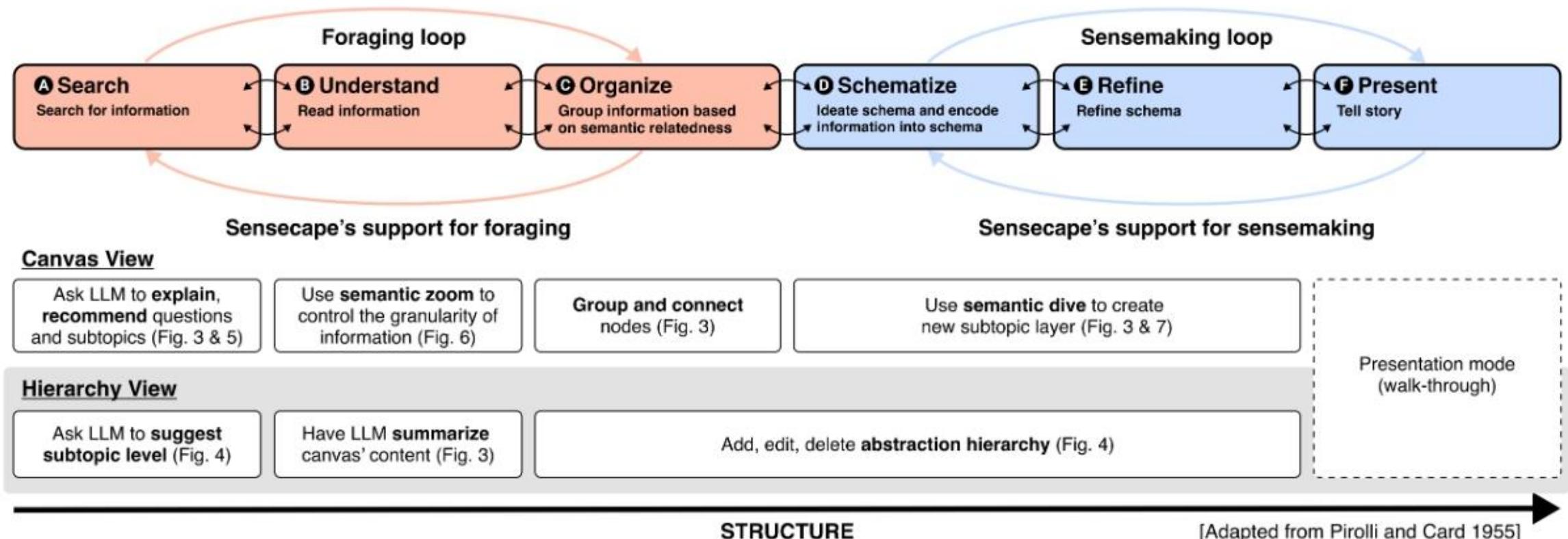


Ramos, G.A., Rachatasumrit, N., Suh, J., Ng, R., & Meek, C. (2022). ForSense: Accelerating Online Research Through Sensemaking Integration and Machine Research Support. ACM Transactions on Interactive Intelligent Systems, 12, 1 - 23.

Horvitz, E. (1999). Principles of mixed-initiative user interfaces.
International Conference on Human Factors in Computing Systems.

SENSEMAKING AUGMENTATION OPPORTUNITIES

(another example)



Suh, S., Min, B., Palani, S., & Xia, H. (2023). Sensecape: Enabling Multilevel Exploration and Sensemaking with Large Language Models. Proceedings of the 36th Annual ACM Symposium on User Interface Software and Technology.

Sensecape

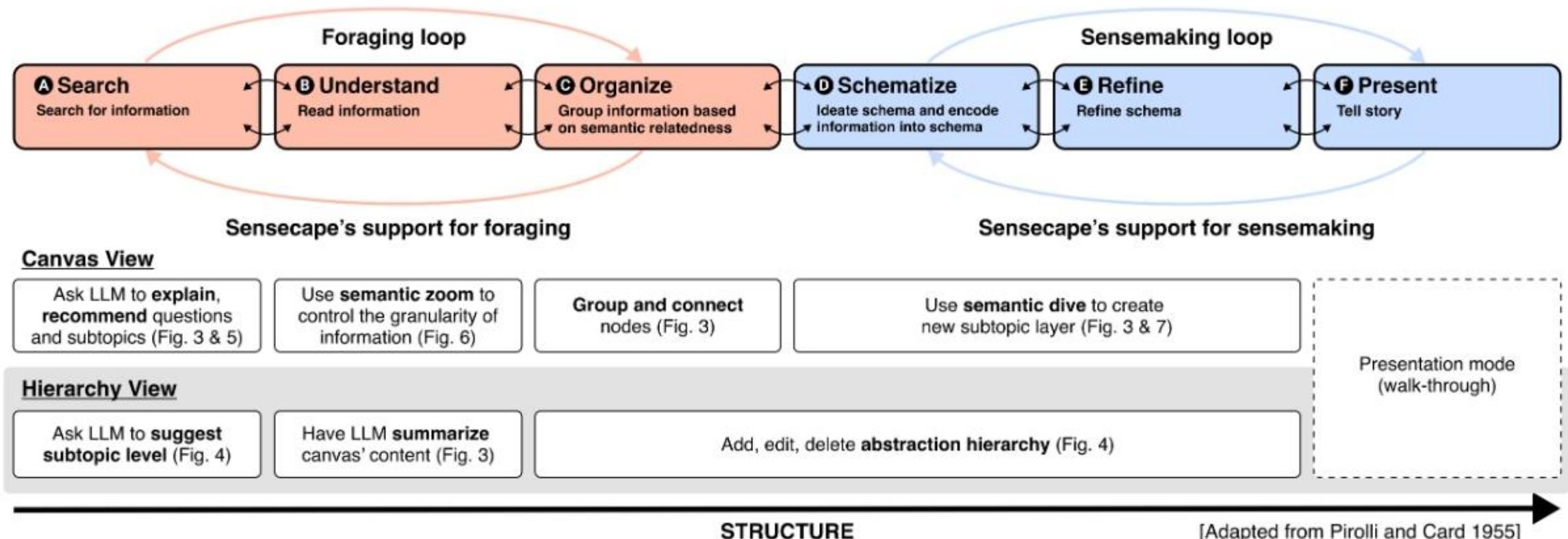
**Enabling Multilevel Exploration and Sensemaking
with Large Language Models**

creativity.ucsd.edu/ai

Creativity Lab University of California San Diego

SENSEMAKING AUGMENTATION OPPORTUNITIES

(another example)



Suh, S., Min, B., Palani, S., & Xia, H. (2023). Sensecape: Enabling Multilevel Exploration and Sensemaking with Large Language Models. Proceedings of the 36th Annual ACM Symposium on User Interface Software and Technology.

ACTIVITIES

Sensemaking

Define a set of documents to work with:

- Bookmarks
- browsing history
- Open tabs

Make sense, meaning...

- Propose Schema
- Given schema, organize documents
- Given schema + documents, communicate story/insights
- ...

TECH GENIUS

THIS POOR WRITER
IS STRUGGLING.
I MUST HELP!

I'M FINE
THANKS.



WHAT YOU NEED IS AN
A.I. THAT DOES THE
WRITING FOR YOU!

NO, I DON'T.
I LIKE WRITING.



LATER:

SURPRISE!
I BUILT AN
A.I. FOR YOU.

BUT IT'S JUST
CHURNING OUT
DERIVATIVE DRIVEL.

ALL AT THE TOUCH
OF A BUTTON!



HOW DO I
MAKE IT STOP?!

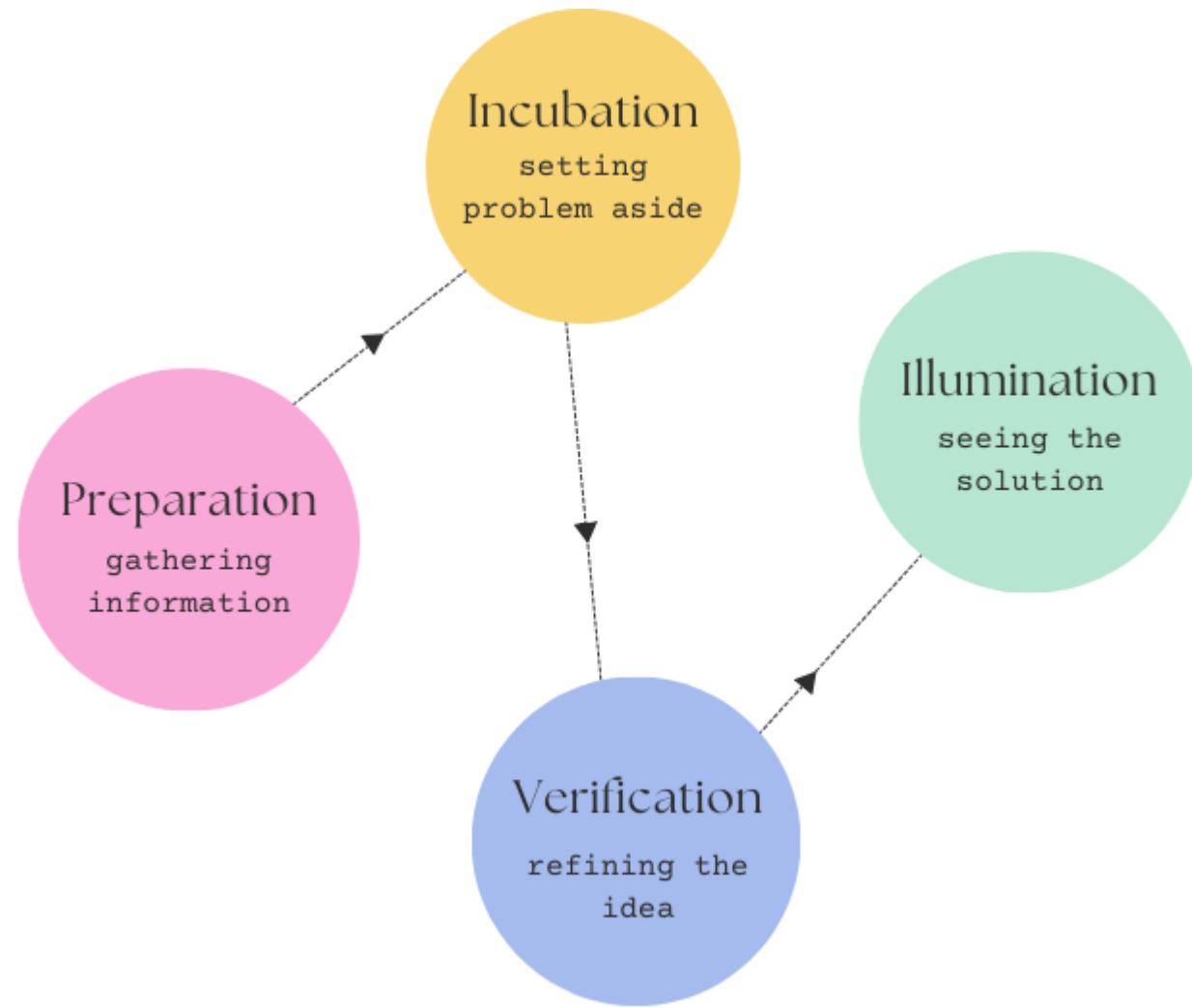
IT NEVER
STOPS!
YOU'RE
WELCOME!



TOM GAULD

IDEATION / CREATIVITY

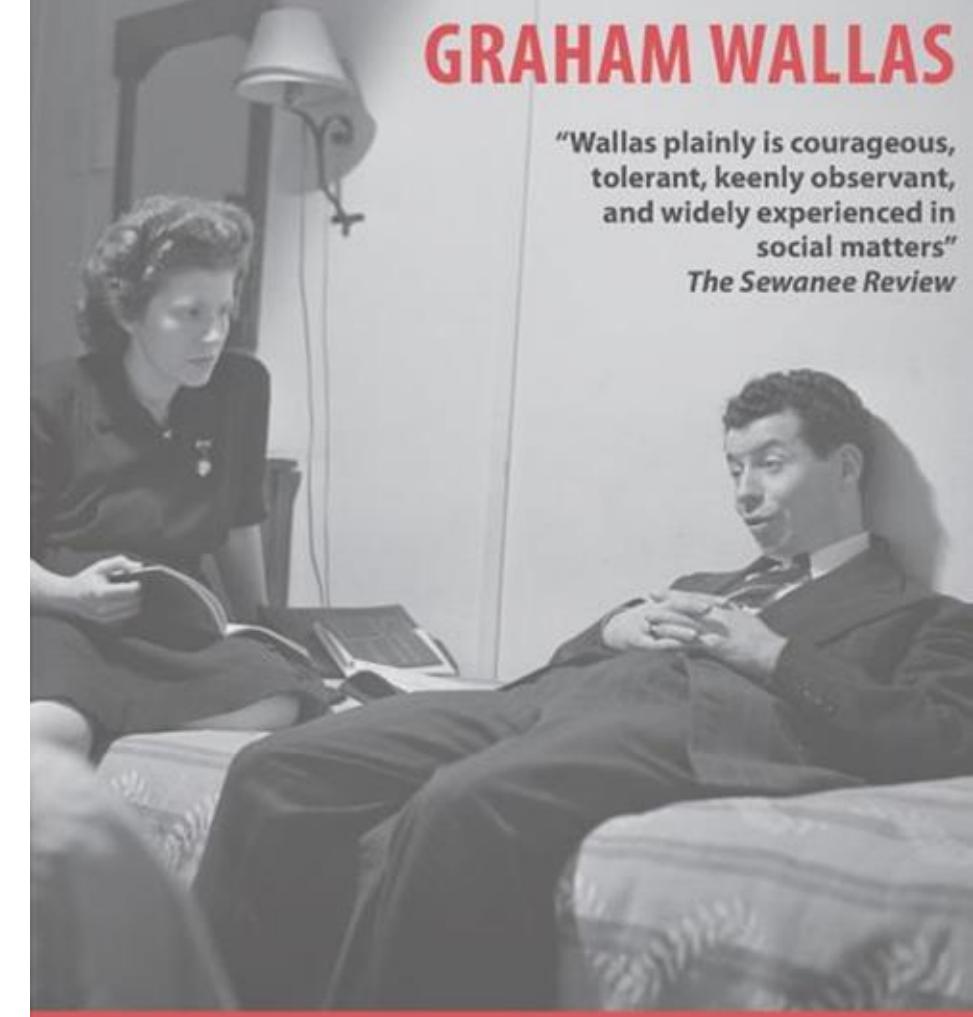
CREATIVITY AS A PROCESS



[The Art of Thought: A Pioneering 1926 Model of the Four Stages of Creativity – The Marginalian](#)

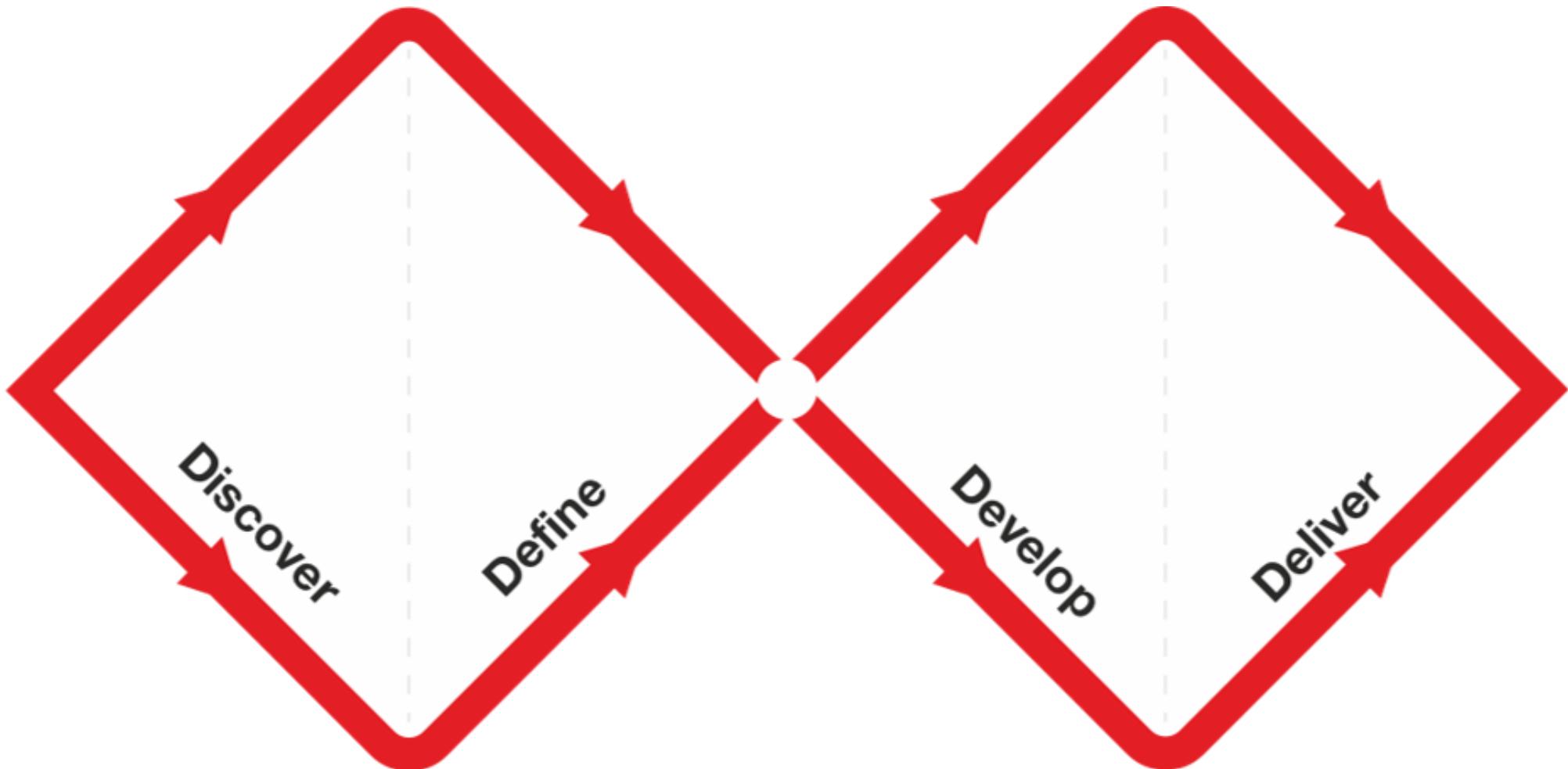
GRAHAM WALLAS

"Wallas plainly is courageous, tolerant, keenly observant, and widely experienced in social matters"
The Sewanee Review



*The Art of
THOUGHT*

CREATIVITY AS A PROCESS (cont.)

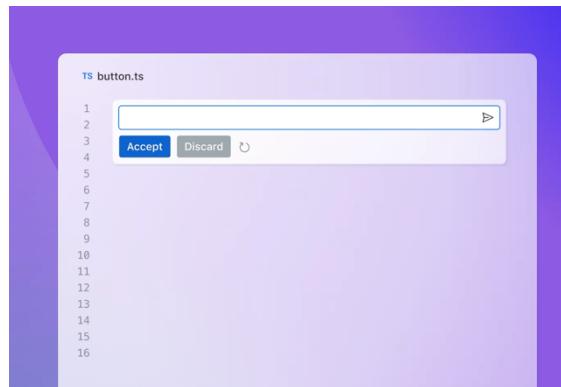


AI + CREATIVITY = DISRUPTION



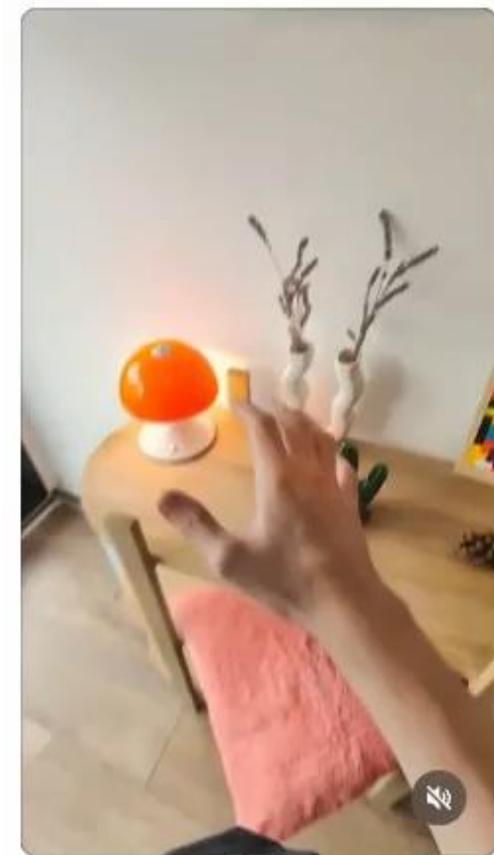
Untitled

+ :: Press 'space' for AI, '/' for commands...



We, the undersigned members of the artist and songwriting communities, call on AI developers, technology companies, platforms and digital music services to cease the use of artificial intelligence (AI) to infringe upon and devalue the rights of human artists.

Make no mistake: we believe that, when used responsibly, AI has enormous potential to advance human creativity and in a manner that enables the development and



How A.I. Tools Could Change India's Elections

Avatars are addressing voters by name, in whichever of India's many languages they speak. Experts see potential for misuse in a country already rife with disinformation.

Share full article



25

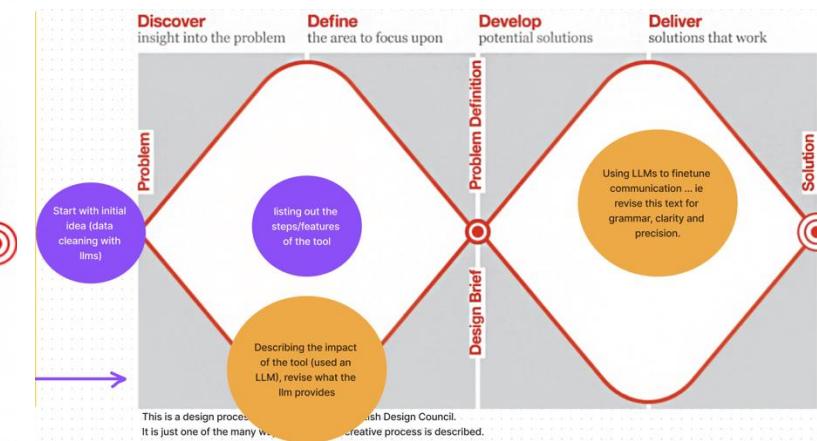
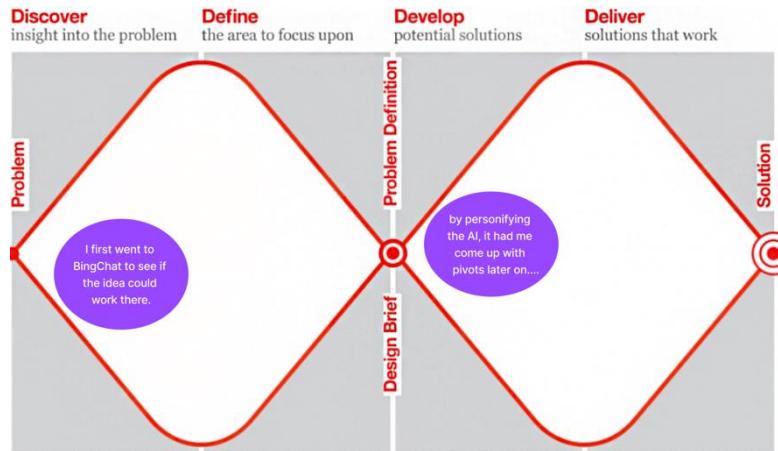
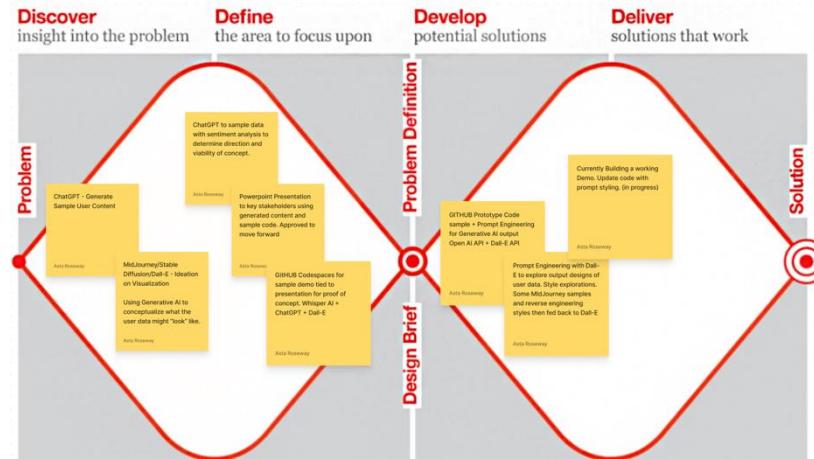
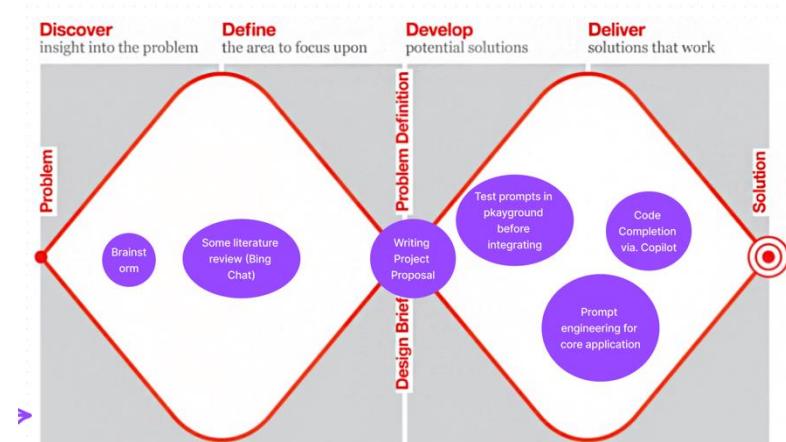
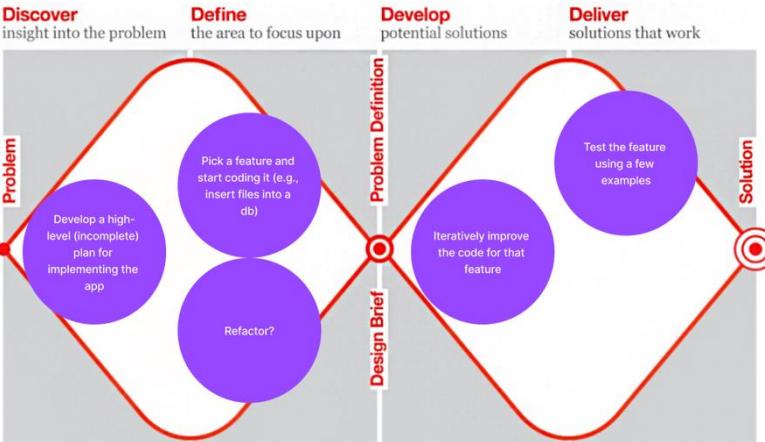
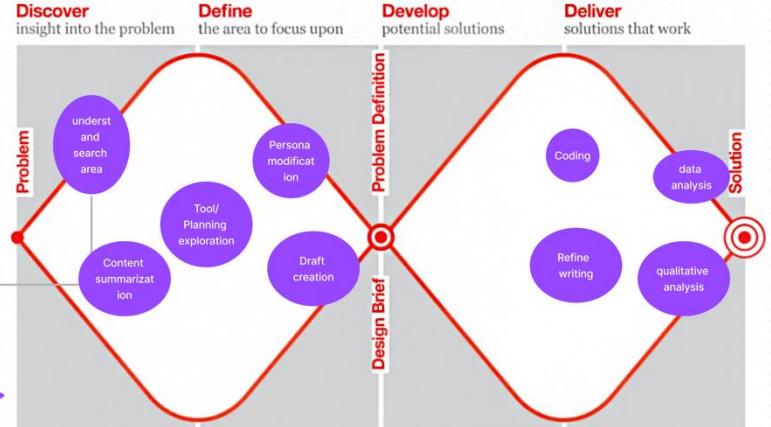
578

18

66



MAPPING OPPORTUNITIES FOR AUGMENTED IDEATION

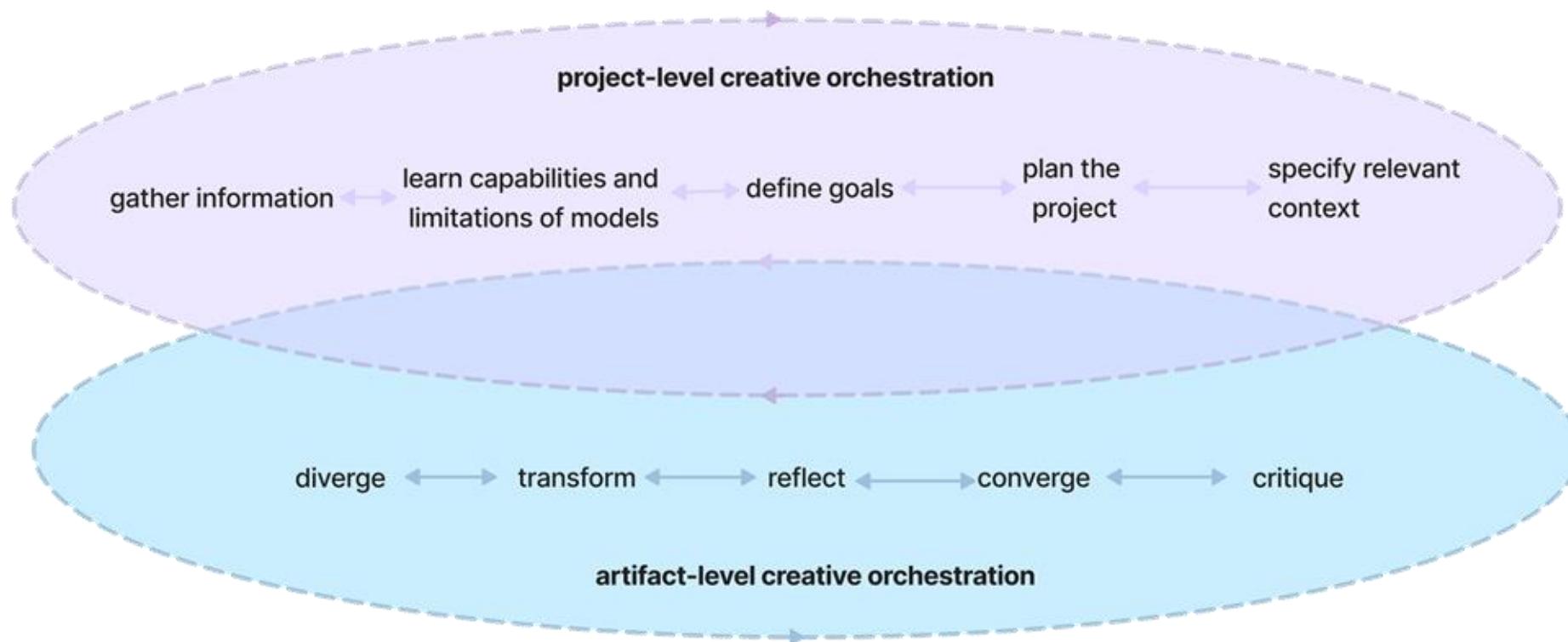


MAPPING OPPORTUNITIES FOR AUGMENTED IDEATION



OPPORTUNITIES FOR AUGMENTED IDEATION

(Orchestration Loops)



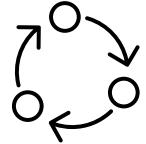
OPPORTUNITIES FOR AUGMENTED IDEATION

OBSERVED CHALLENGES

- Articulating creative goals
- Information and context loss (fragmented ecosystem)
- Checking alignment of goals with GenAI outputs

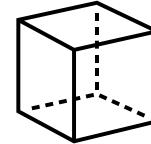
OPPORTUNITIES FOR AUGMENTED IDEATION

PROCESS



- Goal formulation
- Task decomposition
- Context specification
- Task focus

ARTIFACTS



- Divergence
- Reflection
- Convergence
- Analysis / Critique
- Communication

DESIGN PRIORITIES TO CONSIDER

(until we find better ones)

- Preserve focus
- Provide agency for flow
- Augment AND protect thinking
- Provide rich ways to specify context and intent
- Have in-the flow orchestration operations
- Embrace technical limitations



My Workbook

home

[+ Add page](#)

My Context

me

Instructions - Project and Deliverables

Personal_Fitness_Tracker

[Add new... ▾](#)

Project Roadmap.

Project Goals

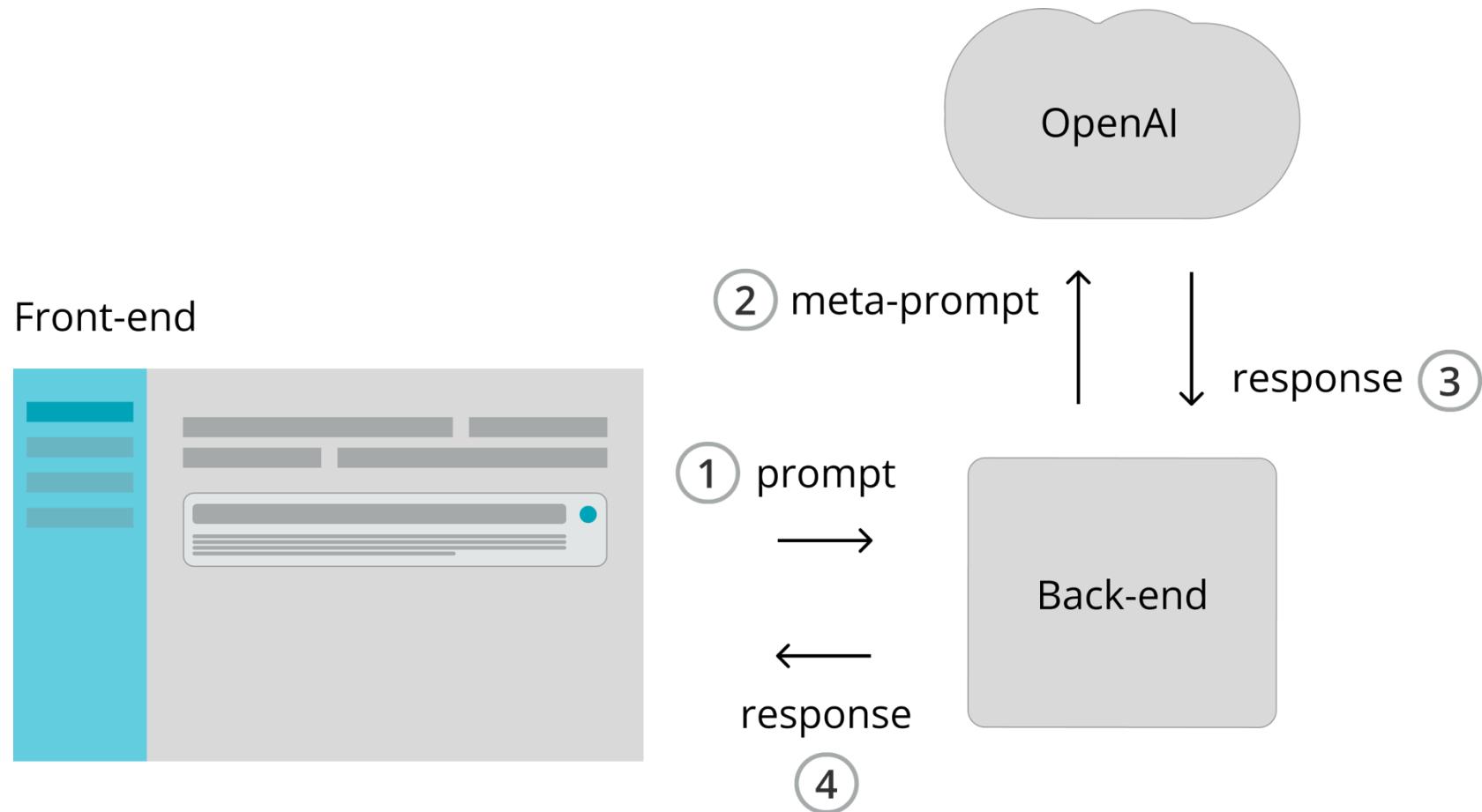
Describe your project goals and objectives

 [execute goal](#)

Amethyst

A Creative Process-Centric Notebook That Leverages Large Language Models

A PEEK UNDER THE HOOD



DID IT WORK?

From an Amethyst vs the Internet (circa 2023) study...

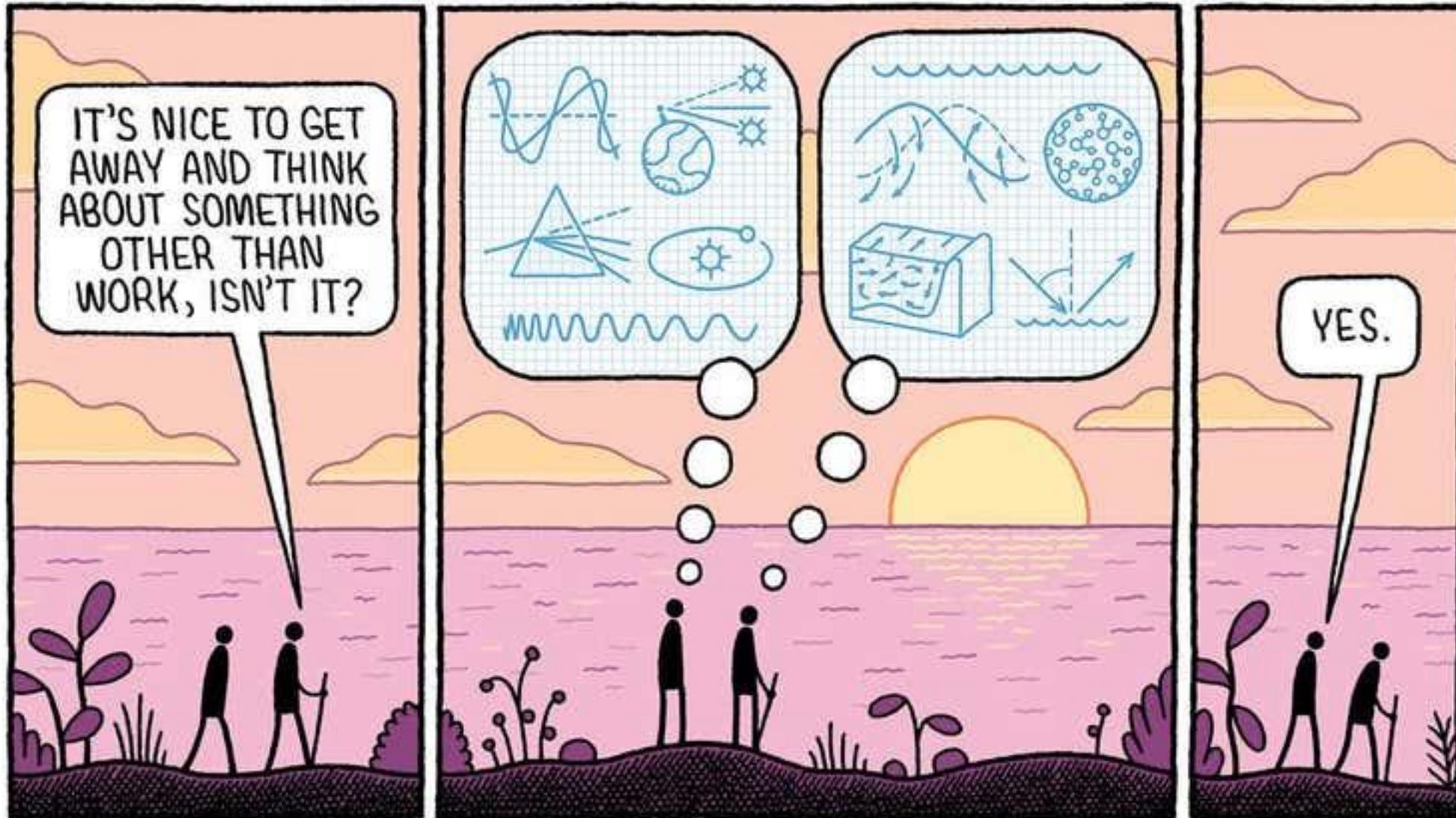
- Amethyst preferred, with more, better ideas
(Novelty, Feasibility, and Value)
- Amethyst more helpful in articulating goals and managing tasks
- Amethyst modulated more empathic outputs
- "Ask Amethyst" was most used operation (*)

ACTIVITIES

Ideation / Creativity

- Help define a SMART creative goal
- Given an 'idea brief', generate n ideas
- Given n ideas, reflect & convergence to reduce them to $m < n$
- Implement a creativity operation
 - Find gaps in an idea
 - Constructive Critique
 - ...
- Given an idea, package as a story/presentation for audience X

SCIENTISTS ON HOLIDAY

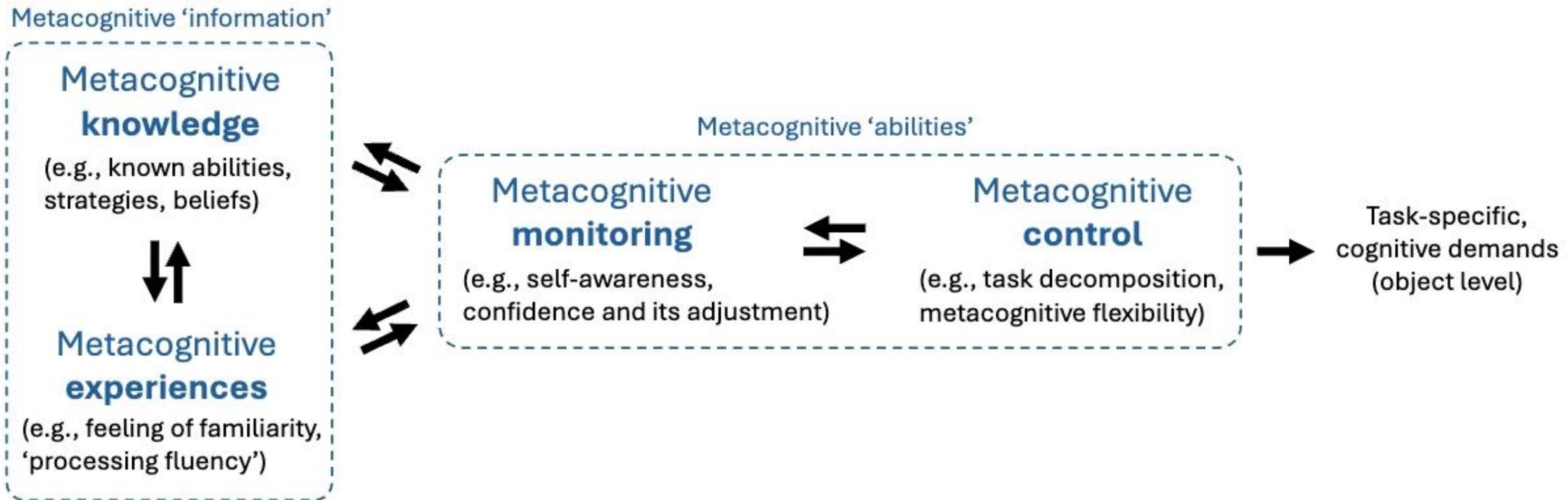


TOM GAULD for NEW SCIENTIST

METACOGNITION

METACOGNITION

(a primer)



METACOGNITIVE DEMANDS *

(and support opportunities)

- Prompting
(set goals, task decomposition, ...)
- Evaluating Prompts and their Output
(reflect, assess confidence, gulf of evaluation)
- How and when to use GenAI (Strategy)
(strategy selection, resource allocation)

(*) how does it align with challenges and opportunities in Ideation Section?

REDUCING METACOGNITIVE DEMANDS

(a starter list)

- GenAI Explainability
(transparency, close gulf of evaluation)
- User Agency / UX customizability
("the path you know")
- Metacognition Literacy
(cognition awareness, regulation strategies)

ACTIVITIES

Metacognition

- Help evaluate the quality / alignment of GenAI outputs
- Generate output using progressive disclosure principles
- Using a text adventure game metaphor, given a task goal and a series of steps, use GenAI to suggest what a user should do next.
- ...

THE HILLS

HEY,
FRANK.

WHAT?

NEVER MIND, YOU
HAD SOMETHING ON
YOUR HEAD, BUT IT'S
GONE NOW.

TOM GAULD

SO...?

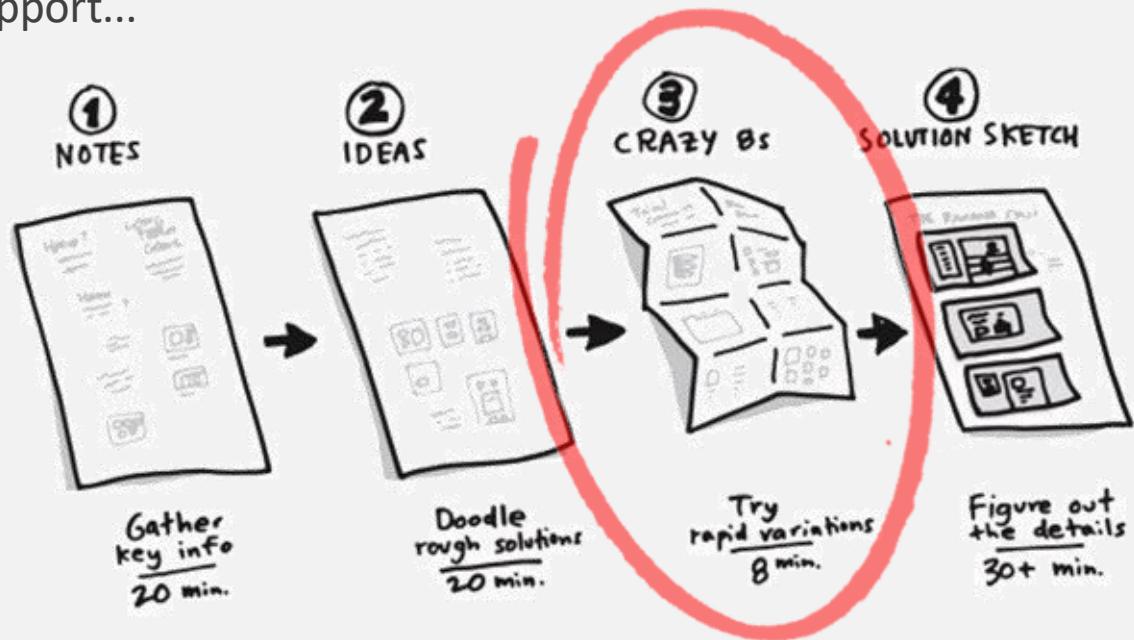
TAKEAWAYS...

- Distributed Cognition, Extended Mind, Metacognition:
useful to frame how to augment thinking with AI.
- Sensemaking and Ideation: rich cognitive processes
with lots of augmentation opportunities with LLMs.
- Creativity: is a full-stack activity.
- Augmentations: do not be perfect, be useful.
- Augmenting thinking is (also) a design problem.

ACTIVITIES

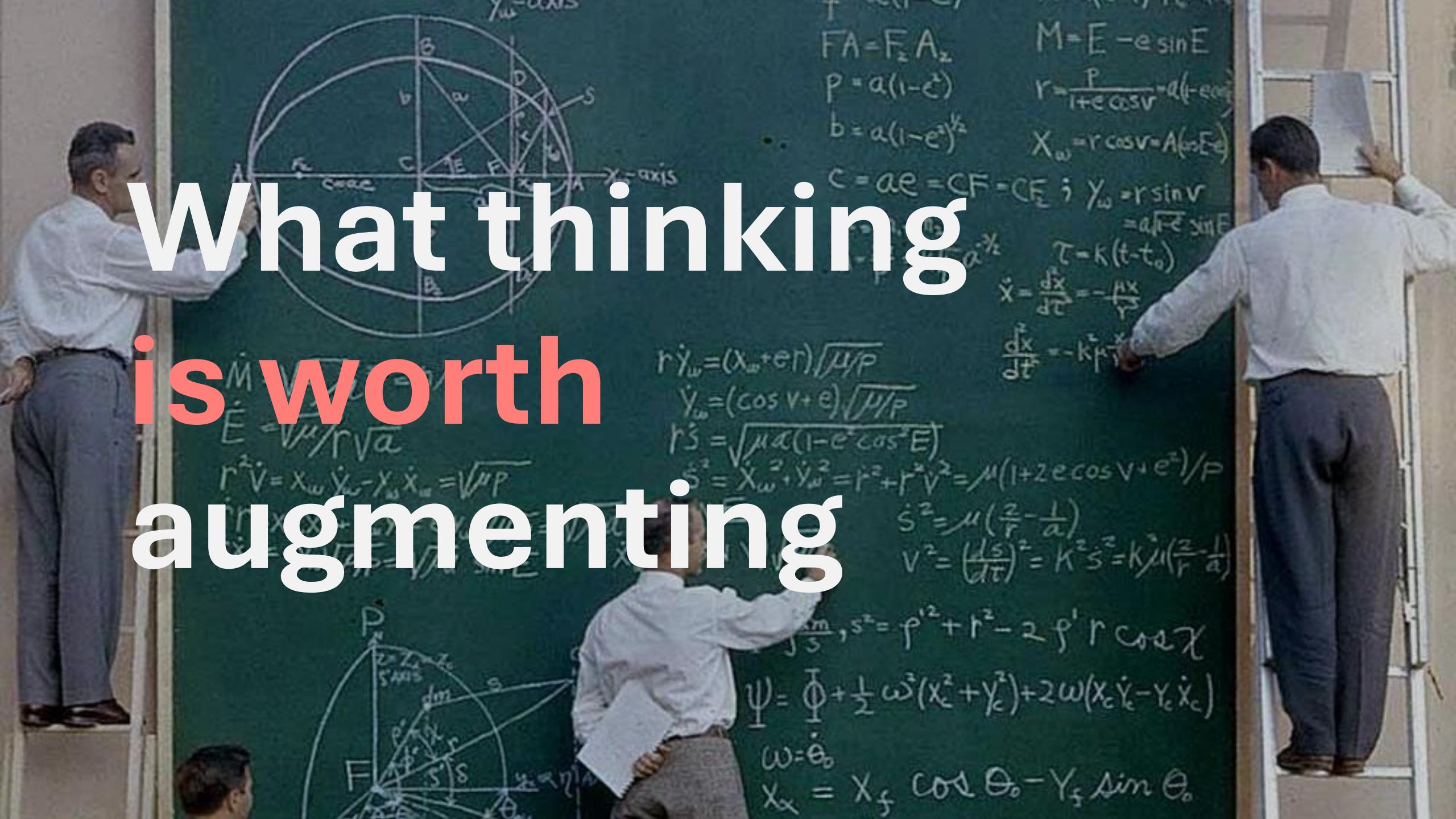
Design!

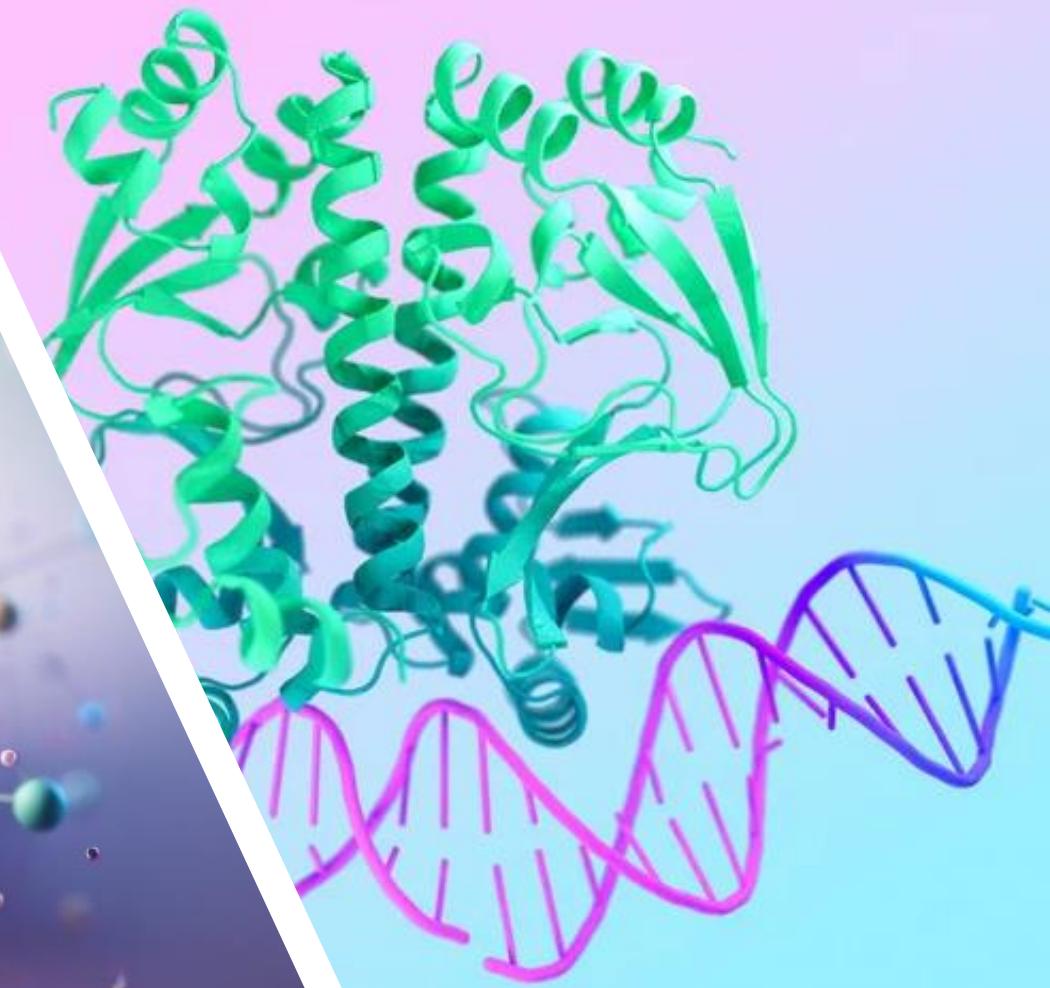
- Use 'design sprint' techniques to sketch design solutions augmented sensemaking, ideation, metacognition support...



PROVOCATIONS

What thinking is worth augmenting





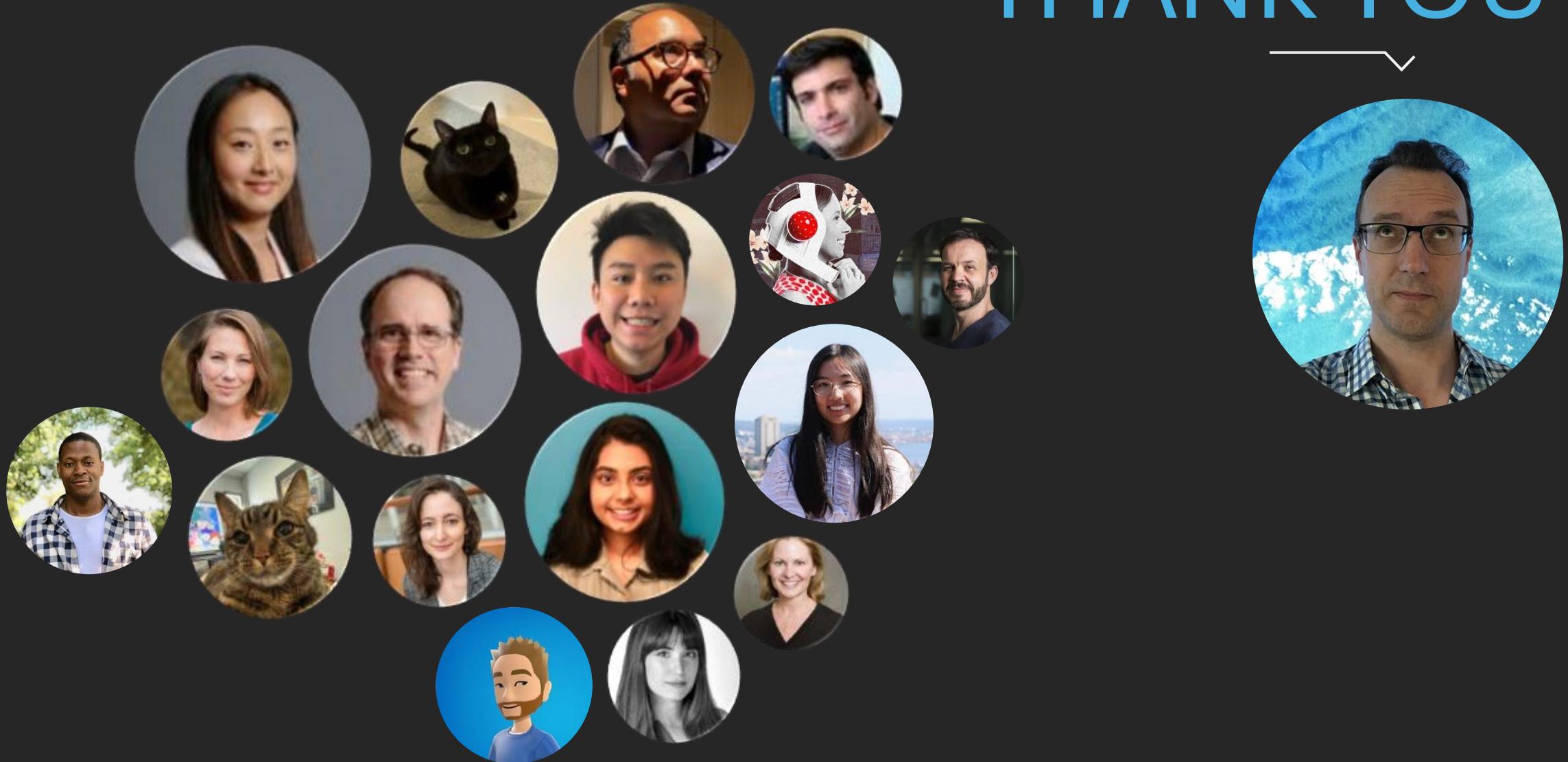
MatterGen





We are in a
Desired Paths
moment

THANK YOU



AUGMENTING IDEATION AND SENSEMAKING IN THE AGE OF LLMs

Concepts, Examples, and Opportunities from an HCI Perspective

as told by Gonzalo Ramos

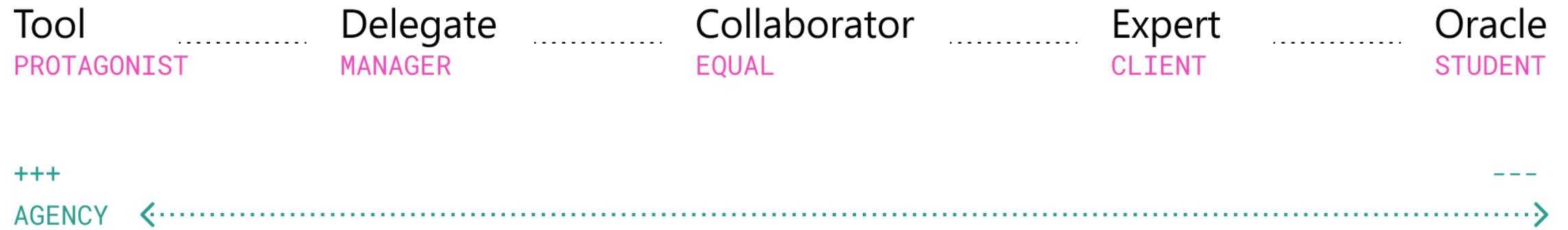
goramos@microsoft.com

<https://www.linkedin.com/in/gonzaloramos/>

<https://www.microsoft.com/en-us/research/people/goramos/>

EXTRAS

About people & AI perceived roles



The Aleph & Other Metaphors for Image Generation Models



Gonzalo A. Ramos, Rick Barraza,
Victor Dibia, and Sharon Lo.

HCAI @ NeurIPS'22



Metaphors as Provocations

We use metaphors to understand, explain, and tell stories about the world.

They are useful until they are not. That is OK.

The metaphors we choose as designers shape what people can do with what we create.

Metaphors suggest affordances.

Infinite Libraries Can Help People Understand IGMs From a HCML Lens

Libraries offer relatable affordances that map well to IGMs.

The **latent space** is the library.



Dimensions within the space are the hallways.



CLIP embeddings are the librarian/index.



Images are books.

These provocations are a starting point to think about how we present IGMs to others, how we expect them to be used, and what affordances we include by design.

Why Infinites?

An infinite library has all the (even nonsensical) books that can exist. IGMs promise engines that can produce any image a person can imagine.

Jorge L. Borges produced stories that often provoked us to think about the infinite. "El Aleph" and "La Biblioteca de Babel" are two key readings.



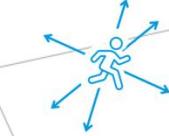
Prompt: A portrait of jorge luis borges, black and white, depth of field, photography
Steps: 25, Sampler: Euler a, CFG scale: 7, Seed: 3533637492, Size: 512x512, Model hash: 7460a6fa

How These Metaphors Inspire Design and Development for IGMs (a starter list)

Interact with the librarian: Have rich, multimodal, explainable prompts and outputs.



Navigate and explore the hallways: Have deliberate, semantic ways to explore the latent space. Define, refine and personalize hallways.



Leverage and help other visitors: As readers find books, they support the mapping of the space, as well as making, using and sharing book annotations.



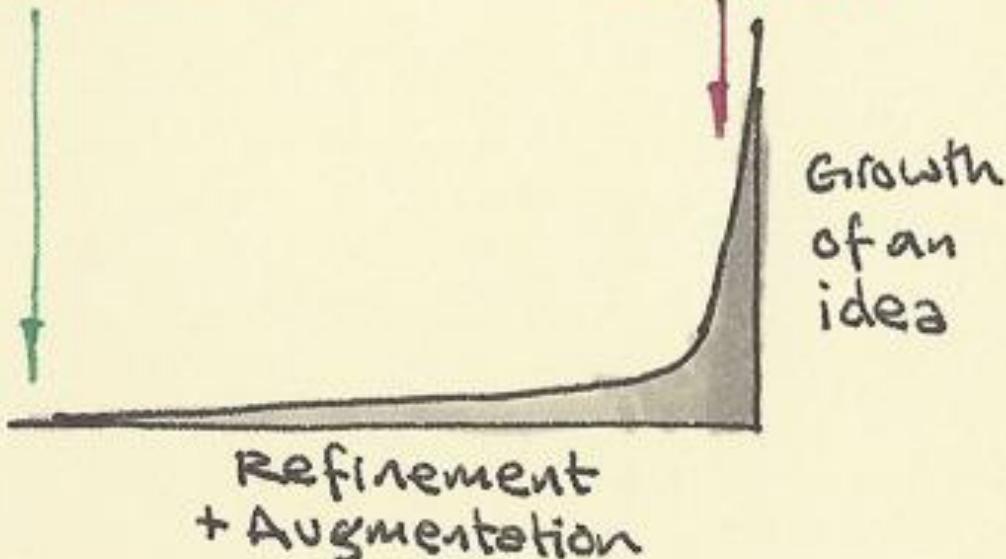
The

Bill Buxton

LONG NOSE OF INNOVATION

INVENTION

TRACTION



The bulk of innovation is behind the wow

"A ton of small incremental work precedes what feels like a wow innovation moment. Computer mice, touchscreens, robotics, CNC machining, haptics etc. were all around for decades before they hit the big time."