



We will get started at 3:10



# Media for Thought

A Samuel Pottinger  
Stat 198: IDSV  
April 14, 2025



# Today

> Intro

Thinkers

Group activity

Wrap up

Final project

# Stop drawing dead fish





# Today

Intro

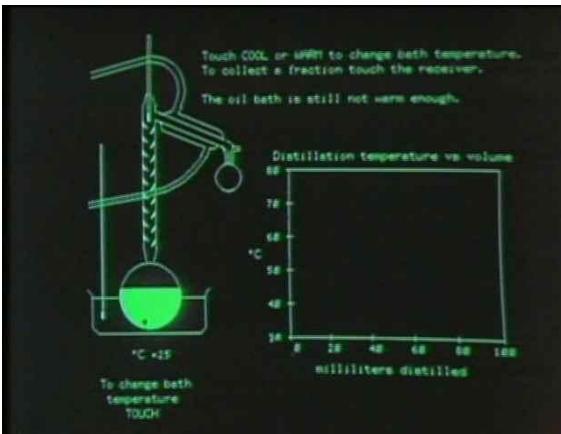
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# Some ingredients - Don Blitzer and Kenneth Iverson



## Notation as a Tool of Thought

Kenneth E. Iverson  
IBM Thomas J. Watson Research Center



**Key Words and Phrases:** APL, mathematical notation  
**CR Category:** 4.2

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The importance of nomenclature, notation, and language as tools of thought has long been recognized. In chemistry and in botany, for example, the establishment of systems of nomenclature by Lavoisier and Linnaeus did much to stimulate and to channel later investigation. Concerning language, George Boole in his *Laws of Thought* [1, p.24] asserted "That language is an instrument of human reason, and not merely a medium for the expression of thought, is a truth generally admitted."

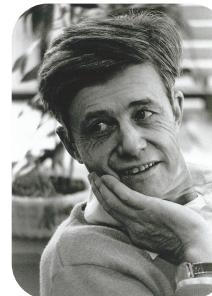
Mathematical notation provides perhaps the best-known and best-developed example of language used consciously as a tool of thought. Recognition of the important role of notation in mathematics is clear from the quotations from mathematical giants in Calori's *A History of Mathematical Notation* [2, pp.332,331]. They are well worth reading in full, but the following excerpts suggest the tone:

By relieving the brain of all unnecessary work, notation sets it free to concentrate on more advanced problems, and in effect increases the mental power of the race.

A.N. Whitehead

Communications  
of  
the ACM

August 1980  
Volume 23  
Number 8



# Some ingredients - Bret Victor

Below is a simplified digital adaptation of the analog state variable filter.

This topology is particularly useful for embedded audio processing, because  $F_c$ ,  $Q$ ,  $k_f$  (feedforward), and  $k_q$  (resonance) are controlled by independent coefficients. (With most filters, the coefficients are functions of both parameters, which precludes pre-calculated lookup tables.)

The coefficients and transfer function are:

$$k_f = 2 \sin(\pi \frac{F_c}{F_s})$$
$$k_q = \frac{1}{Q}$$
$$H(z) = \frac{k_f^2}{1 - (2 - k_f/(k_f + k_q))z^{-1} + (1 - k_f k_q)z^{-2}}$$

Some example frequency responses:

$F_c = 2 \text{ KHz}$   
 $Q = 0.8$

$F_c = 1.2 \text{ KHz}$   
 $Q = 3.5$

## Explorable Explanations

Bret Victor / March 10, 2011

postscript, February 2024

What does it mean to be an **active reader**?

An active reader asks questions, considers alternatives, questions assumptions, and even questions the trustworthiness of the author. An active reader tries to generalize specific examples, and devise specific examples for generalities. An active reader doesn't passively sponge up information, but uses the author's argument as a springboard for critical thought and deep understanding.

Do our reading environments encourage active reading? Or do they utterly oppose it? A typical reading tool, such as a book or website, displays the author's argument, and nothing else. The reader's line of thought remains internal and invisible, vague and speculative. We form questions, but can't answer them.

We consider alternatives, but can't explore them. We question assumptions, but can't verify them. And so, in the end, we blindly trust, or blindly don't, and we miss the deep understanding that comes from dialogue and exploration.



# Some ingredients - Maggie Appleton

The theoretical groundwork for why this kind of dynamic, interactive medium is critical to the future of interfaces has been well-trodden by [Bret Victor](#). In pieces like [Learnable Programming](#) and [Drawing Dynamic Visualizations](#) Bret outlines a series of principles that make programmatic systems learnable. Such as being able to **read the vocabulary** of a programme, **see the state**, and **create by reacting** to what's on the screen in front of you. Programming portals are one way into these design patterns.



Composing rules with linear syntax is open-ended and flexible in a way that's difficult to recreate in visual interface elements. But that doesn't mean we should use *only* syntax. Intertwining graphical representations with logical syntax gives users the best of both worlds.

# Some ingredients - Maggie Appleton

**Tools for Thought  
as Cultural Systems,  
not Computational  
Objects**

Google • December 2022 — Maggie Appleton • @mappletons

Tools for Thought as Cultural Practices,  
not Computational Objects

📍 MIT Thinking with Sand, Online +3

Talk • Over 4 Years Ago



# Some ingredients - Nicky Case



Parable of the Polygons

Evolution of Trust

Explorable Explanations



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Intro

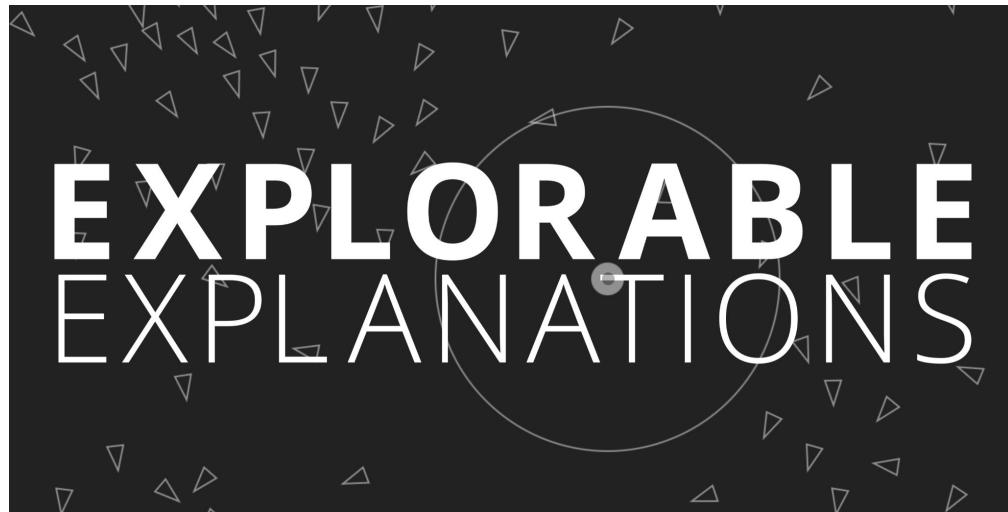
Thinkers

> **Group activity**

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# Group activity: explorables



<https://explorabl.es>

Find an explorable explanation

Identify the user loop

What does that user loop add that a static equivalent would not have?



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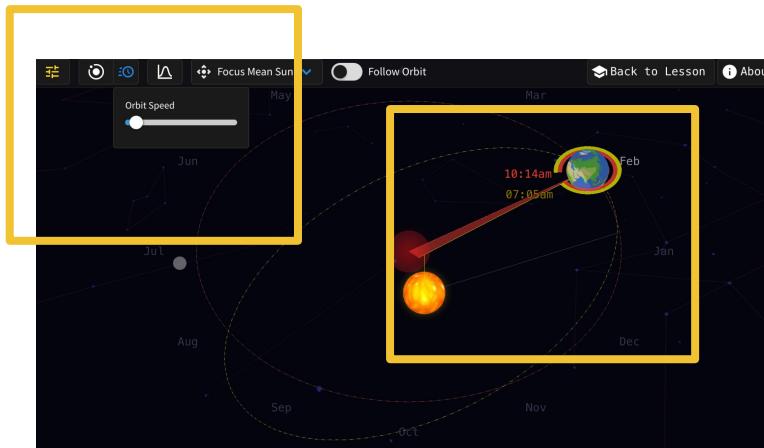
Group activity

> Wrap up

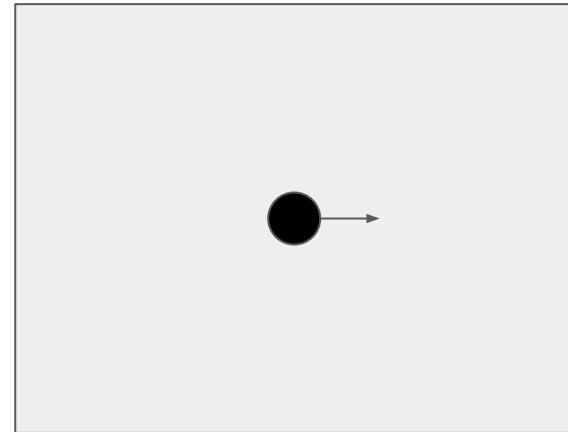
Final project

# Possibility space and diegetic elements

Diegetic elements



Possibility space



# How to think about media for thought

Assume the user to be a co-creator of meaning.

Create space for the user to explore outside of your narrative.

Offer meaningful controls but within a clear possibility space with clear user loops.



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# Final project timeline

April 11: Final assigned.

May 1: Last day to get rough draft feedback.

May 2: Accommodations due.

May 14: Final projects due at 7pm on Zulip

May 14: Live presentations

May 16: Zoom presentation alternative

# Final project objective

**Above all else, this should be an interactive visualization you are proud of.** All else is secondary.

Guidelines on Zulip but at least one user action and at least 6 variables though subject to exceptions (May 2 due date).

Pre-approved datasets in the course manual, reach out by April 21 if you have others.

# Final project logistics

**Live presentations:** We will have three groups, one group will present and the other two provide feedback in expo-style. Only feedback that influences grade is from instructor. Friends and family welcome (may have 1 group be for those without preference or opt-out).

**Zoom alternative:** Direct presentations (not expo) with peer feedback due to Zoom constraints.



# Appendix

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