

Imagination, Pretense, and Make-Believe Worlds

Fall 2025

Time: Tuesdays, 9:45am - 11:45am

Location: Room 950, William James Hall

Instructor: Tomer Ullman (tullman@fas.harvard.edu)

Student Hours: Tuesdays, 1-2pm (Room 190.02, Northwest Building)

(Please review the email policy below when scheduling outside hours)

Sections: N/A

Overview: People spend much of their time in make-believe worlds: children pretend, adults daydream, and both immerse themselves in movies and novels. The imagination plays a large role in our mental lives, different from perception and memory. This seminar will examine imagination, simulation, and pretense from the perspective of modern psychology and cognitive science. We will consider imagination from its infancy in children's play, through its use and abuse in adulthood, up to recent attempts to give machines the ability to imagine and dream.

Textbook: The course does not have a specific textbook. Reading materials from textbooks, books, articles, journals, and so on will be made available online on the course website. Also, the seminar is student-directed and so some readings will change in response to student interests.

Objectives: The main objective is to acquaint the students with current research and debates in the study of the imagination, relevant for future research in cognitive science and psychology, as well as giving them a deeper appreciation of their own mental faculties. Students should also gain an appreciation for classic and modern stances on the imagination more generally, and be able to develop their own proposals for future studies in the field.

Website: We will make use of Canvas, and it will contain readings, announcements, links, assignments, and grades.

Accessibility: Any student needing academic adjustments or accommodations is requested to present a letter from the Accessible Education Office (AEO) and speak with Prof. Ullman by the second week of classes. Failure to do so may result in our being unable to respond to your needs in a timely manner. All discussions will remain confidential, although AEO may be consulted to discuss appropriate implementation.

Grading and Requirements:

Discussion Posts and Replies: 32%

Final Paper: 40%

Attendance and participation: 28%

Grading Scale:

A: 100-95	A-: 95-90	B+: 89-86	B: 85-80
C+: 79-76	C: 75-70	D: 69-62	F: 61 and below

Discussion posts: 32% of your grade will be based on your participation in online discussion outside of class, specifically Posts and Replies. Questions based on the readings and lecture will be put on Canvas weekly, and you will have the option of posting your thoughts on the relevant question. These questions are meant to be relatively open-ended, without a strict 'correct/incorrect' response.

Posts: A good Post is one that engages thoughtfully with the material of that week, by raising points not covered, or weakness and strengths of different viewpoints, outside empirical evidence, or suggestions for new studies, and so on. You are expected to make at least 4 Posts throughout the term of around 200-400 words each, but can make up to 7 (grading will be based on the top 4 Posts, so they are worth 4 points each). A good post ideally makes **one** point, stating it clearly early on, and then backing it up or working it out through the rest of the Post.

Replies: In addition to making posts of your own, you will be asked to reply to other people's Posts. A Reply can be shorter or longer than the original Post (though still within the 200-400 words range), and should engage with it *thoughtfully* and *respectfully*. A reply that is equivalent to "Yeah, definitely" or "Says you!" is not a good reply. As with Posts, you are expected to make at least 4 Replies throughout the term, but can make up to 7 (grading will be based on the top 4 Replies, and they are worth 4 points each).

Final Paper: Final papers will consider an open question in the fields we discuss, with a focus on proposals for empirical investigation.

The paper should:

- Explain the background and relevance of the question, including additional readings related to the topic of choice that were not covered in class. A paper does not have to consider *all* the material covered, it can relate to just one of the topics,
- Suggest ways of answering the question (gathering new evidence, using available data, modeling, etc.)
- Work through the possible outcomes of the data.

Students are encouraged to think of the paper as a skeleton for a research article.

Papers should be between 8-10 pages long (not including a reference section). Draft papers can be submitted 2 weeks before the end of class, and will receive feedback on what can or should be improved, and what grade can be expected based on the draft.

Policies

Academic integrity: This course adheres to the university's standards regarding academic integrity. Suspected cheating or plagiarism will be referred to the Honor Council of Harvard College, as is required by the university. Students are responsible for

knowing what constitutes plagiarism; please refer to the Harvard Guide to Using Sources for a detailed description of the different types of plagiarism.

Attendance: Because this is a seminar, real-time discussion is vital, **and students are expected to attend all classes.** But, I recognize some events and emergencies take precedence over class, and are difficult to plan for. If you are facing an event that prevents you from coming, you can miss one meeting during the term without giving *any* explanation. Anything beyond that will either need to be coordinated in advance (24 hour advance notice), or documentation after the event.

Generative AI Policy: When engaging in the class as far as Posts, Replies, and Final Papers, GenAI tools like ChatGPT, Claude, Gemini and so on are strictly forbidden. Using them will be treated as paying a friend to do your work for you and will be treated accordingly. Also, students are expected to read the papers rather than relying on summaries. Students may engage with AI tools to better their understanding of topics much as they would use any other tool, but are encouraged to keep in mind such tools can get things wrong.

Email Policy and scheduling meetings: I am happy to meet with any student for any reason, and you are encouraged to come to student hours. When asking to meet at an alternate time outside student hours, please include three proposed times and a description of the reason for meeting. Questions having to do with the syllabus or assignments are best shared with the class, and so it is better to ask these during or right after class.

Schedule and readings:

(Note that readings are subject to change, especially as the class progresses)

(NOTE THAT THE SPECIFIC DATES ARE NOT UPDATED FOR 2025 YET)

PROLOGUE: Setting the Stage

September 2nd: Introduction to the course

Imagination: What is it? And what is good for, if anything?

- Class structure
- Take imagery survey

Discuss readings:

- Statistics of Mental Imagery, Galton (1883),
- Selected readings from "Fantastic Literature, a critical reader", Sandner, 2004:
 - o *The Fantastic Imagination* (1890), George MacDonald.
 - o *Phaedrus*, Plato (excerpt, *ibid*)
 - o *The Poetics*, Aristotle (excerpt, *ibid*)
 - o *On the Pleasure Derived from Objects of Terror* (1773), Anna Aikin (excerpt, *ibid*)
- Pages 538-545, "How the Mind Works" (1997, 1st edition, Pinker, section on fiction)

- Response to Pinker by Fodor, London Review of Books

Optional:

- The Architecture of The Imagination, Introduction, *ed. Shaun Nichols* (2006)

ACT I: The Stage in the Mind's Theater, Mental imagery

September 9: Turning things in your mind; Simulation; Imagery

- Shepard, R. N., & Metzler, J. (1971). Mental rotation of three-dimensional objects. *Science*, 171(3972), 701-703.
- Shepard, R. N., & Judd, S. A. (1976). Perceptual illusion of rotation of three-dimensional objects. *Science*, 191(4230), 952-954.
- Chapter 3, from Handbook on Imagination and Mental Simulation (*eds Markman, Klein, Suhr*)
- Kosslyn, S., Pinker, S., Smith, G., & Shwartz, S. (1979). On the demystification of mental imagery. *Behavioral and Brain Sciences*, 2(4), 535-548.
- Battaglia, P. W., Hamrick, J. B., & Tenenbaum, J. B. (2013). Simulation as an engine of physical scene understanding. *Proceedings of the National Academy of Sciences*, 110(45), 18327-18332 (focus on experiments 1+2)

Choose one of the following:

- Chater, N., & Oaksford, M. (2013). Programs as causal models: Speculations on mental programs and mental representation. *Cognitive Science*, 37(6), 1171-1191.
- Introduction of "Mental images and their transformations", (Shepard and Cooper, 1986)
- Chapters 2 from Handbook on Imagination and Mental Simulation (*eds Markman, Klein, Suhr*)

Once you're done reading on mental transformation and mental images, you may want to reconsider Macbeth's famous soliloquy:

*Is this a dagger which I see before me,
The handle toward my hand? Come, let me clutch thee.
I have thee not, and yet I see thee still.
Art thou not, fatal vision, sensible
To feeling as to sight? or art thou but
A dagger of the mind, a false creation,
Proceeding from the heat-oppressed brain?
I see thee yet, in form as palpable
As this which now I draw.*

September 16: The Great Imagery Debate; Stumpers and Make Believe; Aphantasia

- Pylyshyn, Z. W. (2002). Mental imagery: In search of a theory. *Behavioral and brain sciences*, 25(2), 157 (focus on the main argument, pages 1-26)
- The Case for Mental Imagery, Chapter 1 + Chapter 2 (Kosslyn, Thompson, Ganis book, OUP 2006)
- Bar-Hillel, M., Noah, T., & Frederick, S. (2018). Learning psychology from riddles: The case of stumpers. *Judgment & Decision Making*, 13(1).
- [Bonus: Bar-Hillel, M. (2020). An Annotated Compendium of Stumpers. *Available at SSRN.*]
- Balaban, H., & Ullman, T. D. (2025). Physics versus graphics as an organizing dichotomy in cognition. *Trends in Cognitive Sciences*.

Aphantasia – a lack of mind's eye? All read:

- Zeman, A. Z., Dewar, M., & Della Sala, S. (2015). Lives without imagery- Congenital aphantasia.
- Keogh, R., & Pearson, J. (2018). The blind mind: No sensory visual imagery in aphantasia. *Cortex*, 105, 53-60.
- See also: <https://aphantasia.com> (Try assessment on yourself!)

ACT II: Moving the Scenery: Counterfactuals

September 23: Theories of counterfactuals; what are counterfactuals good for? What do they show us about the structure of the imagination?

- Roese, N. J. (1997). Counterfactual thinking. *Psychological bulletin*, 121(1), 133.
- Kahneman, D., & Tversky, A. (1981). *The simulation heuristic* (No. TR-5). Stanford Univ CA Dept of Psychology
- Byrne, R. M. (2016). Counterfactual thought. *Annual review of psychology*, 67, 135-157.
- Gerstenberg (2024), Beyond the Here and Now, *Trends in Cognitive Science*
- Gerstenberg, T., Goodman, N., Lagnado, D., & Tenenbaum, J. (2020). A counterfactual simulation model of causal judgment (way too long, focus on the introduction)
- Byrne, R. M. (2007). *The rational imagination: How people create alternatives to reality*. MIT press. [Introduction + Chapter 3]

September 30: Essentialism, Make-Believe Worlds, Intuitive Theories, What's Easy and Hard; Sherlock Holmes the woman detective?

- Pop piece: Gelman, S. A. (2005). Essentialism in everyday thought. *Psychological Science Agenda*, 19(5), 1-6.
 - o In more detail: Gelman, S. A. (2003). *The essential child: Origins of essentialism in everyday thought*. Oxford University Press, USA.
- Gerstenberg, T., & Tenenbaum, J. B. (2017). Intuitive theories. *Oxford handbook of causal reasoning*, 515-548.
- Phillips, J., & Cushman, F. (2017). Morality constrains the default representation of what is possible. *Proceedings of the National Academy of Sciences*, 114(18), 4649-4654.
- McCoy, J., & Ullman, T. (2019). Judgments of effort for magical violations of intuitive physics. *PloS one*, 14(5), e0217513.

Bonus for fun: “*Fantastic Beasts and how to Rank Them*” (Schulz, *New Yorker*, 2017)

Bonus not for fun: Braisby, N., Franks, B., & Hampton, J. (1996). Essentialism, word use, and concepts. *Cognition*, 59(3), 247-274.

Act III: Exeunt, Followed by a Bear: Children and other animals

Is imagination unique to humans? Unique to children? Innate? Are children special when it comes to the imagination, and if so how?

October 13: Reality/Imagination distinction in children

- Susan Carey, *Conceptual Change in Childhood* (1985), Chapter 1: What is Alive?
- Bloom, P., & Skolnick, D. Intuitive Cosmology of Fictional Worlds. *The Architecture of the Imagination: New Essays on Pretence, Possibility, and Fiction*, 73-86.
- Weisberg, D. S. (2013). Distinguishing Imagination. *The Oxford handbook of the development of imagination*, 75-93
- Singer, J. L., & Singer, D. G. (2013). Historical overview of research on imagination in children. *The Oxford handbook of the development of imagination*, 11-27.

October 20: Children's developing understanding of counterfactuals, possibilities, etc.

- Harris, P. L. (2000). *The work of the imagination*. Blackwell Publishing. Chapter 2 + Chapter 3

- Gopnik, A. (2020). Childhood as a solution to explore–exploit tensions. *Philosophical Transactions of the Royal Society B*, 375(1803), 20190502.
- Harris, 2020 review on children's realism (including video lecture)

October 27: Children and non-human animals, play.

- Shtulman, A., & Carey, S. (2007). Improbable or impossible? How children reason about the possibility of extraordinary events. *Child development*, 78(3), 1015-1032.
- Redshaw, J., & Suddendorf, T. (2016). Children's and apes' preparatory responses to two mutually exclusive possibilities. *Current Biology*, 26(13), 1758-1762.
- Raby, C. R., Alexis, D. M., Dickinson, A., & Clayton, N. S. (2007). Planning for the future by western scrub-jays. *Nature*, 445(7130), 919-921
- Gruber, R., Schiestl, M., Boeckle, M., Frohnwieser, A., Miller, R., Gray, R. D., ... & Taylor, A. H. (2019). New Caledonian crows use mental representations to solve metatool problems. *Current Biology*, 29(4), 686-692.
- Pailian, H., Carey, S. E., Halberda, J., & Pepperberg, I. M. (2020). Age and Species comparisons of Visual Mental Manipulation Ability as evidence for its Development and evolution. *Scientific reports*, 10(1), 1-7.
- Drayton, L. A., & Santos, L. R. (2018). What do monkeys know about others' knowledge?. *Cognition*, 170, 201-208.

ACT IV: Bricks and Mortar -- Neuroscience of the imagination

November 3rd:

- Kosslyn, S. M., Thompson, W. L., & Ganis, G. (2006). *The case for mental imagery*. Oxford University Press. – Chapter 4 + Chapter 5
- Foster, D. J. (2017). Replay comes of age. *Annual review of neuroscience*, 40, 581-602
- Pearson, J. (2019). The human imagination: the cognitive neuroscience of visual mental imagery. *Nature Reviews Neuroscience*, 20(10), 624-634.
- Zeidman, P., & Maguire, E. A. (2016). Anterior hippocampus: the anatomy of perception, imagination and episodic memory. *Nature Reviews Neuroscience*, 17(3), 173-182.
- Fox, K. C., Girn, M., Parro, C. C., & Christoff, K. (2018). Functional neuroimaging of psychedelic experience: An overview of psychological and neural effects and their relevance to research on creativity, daydreaming, and dreaming.

- Roy et al., A transformation from vision to imagery in the human brain

CUT/OPTIONAL: Perspective taking, First and Third Person, (and a bit on motivation)

- Libby, L. K., Shaeffer, E. M., Eibach, R. P., & Slemmer, J. A. (2007). Picture yourself at the polls: Visual perspective in mental imagery affects self-perception and behavior. *Psychological Science*, 18(3), 199-203.
- Freton, M., Lemogne, C., Bergouignan, L., Delaveau, P., Lehericy, S., & Fossati, P. (2014). The eye of the self: precuneus volume and visual perspective during autobiographical memory retrieval. *Brain Structure and Function*, 219(3), 959-968.
- Sutin, A. R., & Robins, R. W. (2010). Correlates and phenomenology of first and third person memories. *Memory*, 18(6), 625-637
- Vasquez, N. A., & Buehler, R. (2007). Seeing future success: Does imagery perspective influence achievement motivation?. *Personality and social psychology bulletin*, 33(10), 1392-1405.
- Libby, L. K., & Eibach, R. P. (2011). Visual perspective in mental imagery: A representational tool that functions in judgment, emotion, and self-insight. In *Advances in experimental social psychology* (Vol. 44, pp. 185-245). Academic Press
- Butler, A. C., Rice, H. J., Wooldridge, C. L., & Rubin, D. C. (2016). Visual imagery in autobiographical memory: The role of repeated retrieval in shifting perspective. *Consciousness and cognition*, 42, 237-253.

ACT V: Heckled by the Crowd – Philosophical notes

November 10th: Conceivability and possibility; Thought experiments; Contagion

- Introduction, Gendler, T. S., & Hawthorne, J. (Eds.). (2002). *Conceivability and possibility*. Clarendon Press
- Thought Experiments, by Sorensen, Chapter 31 in Kind, A. (Ed.). (2016). *The Routledge handbook of philosophy of imagination*. Routledge.
- Gendler, T. S. (2006). Imaginative contagion. *Metaphilosophy*, 37(2), 183-203 (students can also follow up with later work on 'alief')
- Sorensen, R. (2002). The art of the impossible. Chapter 9 in *Conceivability and possibility*, (pages 337-68).

[[Students can also pick topics from the books edited by Kind or Gendler/Hawthorne or Nichols]]

November 17th: Imaginative resistance: Wouldn't, couldn't, or shouldn't?

- Revisit short paragraphs from Hume, Macdonald, possibly William of Occam.
- *The following 3 pieces form a companion reading best read together. Students who want to chase this debate can also go back to the 90's Walton pieces*
 - o Gendler, T. S. (2000). The puzzle of imaginative resistance. *The Journal of Philosophy*, 97(2), 55-81.
 - o Walton, K. (2006). On the (so-called) puzzle of imaginative resistance. *The architecture of the imagination: New essays on pretence, possibility, and fiction*, 137-148.
 - o Gendler, T. S. (2006). Imaginative resistance revisited. *The architecture of the imagination: New essays on pretence, possibility, and fiction*, 149-173.
- Miyazono, K., & Liao, S. Y. (2016). The cognitive architecture of imaginative resistance. Chapter 17 in *The Routledge Handbook of Philosophy of Imagination*, (pages 233-246).
- Liao, S. Y., Strohminger, N., & Sripada, C. S. (2014). Empirically investigating imaginative resistance. *British Journal of Aesthetics*, 54(3), 339-355.
- Smuts, A. (2016). The ethics of imagination and fantasy, Chapter 28 *The Routledge handbook of philosophy of imagination*. Routledge ← **content warning:** *By the very nature of discussing non-ethical examples of the imagination, the author asks us to consider bringing to mind certain situations such as rape or animal suffering. The examples are not detailed or graphic, but they are there. If you prefer not to engage with those examples I understand. If you would in addition prefer that we not touch on such examples (or others) in the class, please let me know*

November 24th: (Thanksgiving)

December 1st: Last day summary: Imagination, what, why? Students pick topic for own reading and present it, as well as give overall view of what they think the imagination and its role/goal is (if anything) in light of the course.

Left on cutting room floor, optional topics for students to expand on: Henri and Henri 1891, Opie and Opie 1950's, 'Mimesis as make belief', more readings on narratives, stories, games, dreams, and AI