

NxtLight Scientific Computing

A Theory of Bounded Beliefs:

How Narrative Belief Forms, Spreads, and Distorts

Summary Document

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This is a summary of my current research on this topic. The full article is available on request.

Introduction

A person who knows a film is fiction still comes out of the theater with a real, measurable shift in what they believe, and that shift can last for months. That is not irrational, and it is not a special property of storytelling. It is a predictable outcome of the fact that belief, at every stage of its life, is built and handled by systems with limited capacity. This summary walks through those systems in plain terms: how a piece of information first gets weighted, what happens to it once it is stored in memory, how it changes as it moves between people, and why explanations for why something happened behave differently from beliefs about isolated facts. The throughline is simple: at every stage, a biological or social system that cannot afford to do the expensive, thorough thing substitutes something cheaper that usually works well enough. Distortion is not a malfunction of that process. It is what the process reliably produces.

The Big Picture: Four Bottlenecks, Not One

It is tempting to treat belief formation as a single event: evidence comes in, a person evaluates it, a belief results. That picture breaks down almost immediately once you ask what happens after the evidence arrives. The information has to be weighted for trust and salience before it is even stored. What gets stored is not a clean copy but a reconstruction, and that reconstruction changes every time it is retrieved. Most information a person holds did not come from direct experience at all, but from another person who told them about it, filtered through that person's own bounded memory and their own motives for telling the story a certain way. And a large share of what people believe is not a single fact but an explanation, a small causal story about why something happened, which behaves differently from an isolated fact because it has to compete against rival explanations rather than simply being true or false on its own.

Four bottlenecks, four points where a costly, thorough process gets replaced by a cheap approximation:

- Weighting an incoming signal, where verifying a claim is too costly to do for everything, so vividness and trust substitute for verification.
- Storing and retrieving a memory, where perfect, permanent storage is not biologically available, so the brain reconstructs rather than replays.
- Transmitting belief between people, where independently checking every claim a person hears is too costly, so trust in a small circle of others substitutes for independent verification.
- Choosing among competing explanations, where comparing every conceivable account of why something happened is too slow, so an explanation that clears a good-enough threshold gets accepted rather than the most accurate one being exhaustively identified.

Each of these is well documented on its own. The useful move is seeing them as four instances of the same underlying constraint, a system operating with limited time, limited storage, and limited ability to independently verify anything, rather than four unrelated quirks of human psychology.

Bottleneck One: Weighting a Signal

The brain does not treat every piece of incoming information equally. It behaves, approximately, like a system that blends what it already believes with how convincing the new information seems, and convincingness is not the same thing as truth. A source's credibility matters, but so does how emotionally engaging the information is, how much attention it captures, and how socially confident the person delivering it seems. A well-told story recruits attention and emotion in a way a plain fact sheet does not, and that recruitment functions, biologically, much like an increase in how strongly the new information gets weighted against prior belief. This is why fiction persuades: the brain's weighting system responds to engagement and vividness, not to a conscious tag reading fiction or nonfiction. A person can correctly know a story is invented and have that knowledge do almost nothing to blunt the story's effect on what they end up believing, because the discount for known fictional status and the boost from emotional engagement operate on largely separate channels, and the boost is often the stronger of the two.

This also explains a genuinely surprising research finding: across large numbers of controlled studies, entertainment-first fiction that was never designed to persuade anyone of anything shifts attitudes and behavior by about the same amount as content purpose-built to educate, and the effect holds up weeks or months after exposure, not just in the moment. A weighting system built around engagement rather than source-verification predicts exactly that pattern.

Bottleneck Two: Memory Is Reconstruction, Not Recording

This is the piece of the picture with the most direct biological grounding, and it is worth being precise about. When a previously stored memory is reactivated, retrieved, recalled, thought about again, it does not simply get read out. It re-enters a temporarily unstable, protein-synthesis-dependent state and has to be actively re-stabilized before it becomes durable again. While it is in that unstable state, it can be strengthened, weakened, or altered by whatever else is happening at the moment of recall. This means every act of remembering something is also an opportunity to change it, whether or not the person intends to change anything. Retelling a story to someone else counts as an act of recall in exactly this sense: the storyteller is not reading a fixed internal file out loud, they are reconstructing the memory in real time, and that act of reconstruction can leave the memory itself different afterward.

On top of that instability, recall itself fills in gaps using general expectations rather than replaying an exact record. A remembered story tends to be reorganized toward whatever is conventional, expected, and easy to make sense of, and successive retellings measurably simplify and tidy up a story over time, dropping unusual details and smoothing the sequence of events into something more like a familiar template. Two further points matter here. First, memories do not decay uniformly: the central gist of an event, particularly the parts that are causally connected to why something happened, are retained far longer than peripheral detail, which fades comparatively quickly. Second, retrieving one version of a memory measurably suppresses competing versions, so whichever account of events gets rehearsed and retold is the account that survives, while alternative details that never get repeated fade faster than they otherwise would. None of this requires anyone to be lying or even consciously editing anything. It is what a reconstructive, resource-limited memory system does as a matter of course.

Bottleneck Three: Belief Moves Between People Unevenly

Most of what any person believes did not come from their own direct observation. It came from someone else, and independently verifying every claim a person hears would be prohibitively expensive, so people rely on a small set of trusted sources instead, generally people who share visible markers of belonging to the same group, since shared identity is a cheap, if imperfect, stand-in for reliability. What gets transmitted along that channel is not a clean copy of the original belief. Group conversation about a shared experience routinely produces a documented effect called social contagion of memory, in which information known to only one person in a group spreads to and gets adopted by the others, including when that information is wrong. This process is not evenly weighted either: whoever

speaks first, or speaks with the most confidence, disproportionately shapes what everyone else in the group ends up remembering, more than a simple average of everyone's input would predict.

The structure of the surrounding social network changes the outcome. In a tightly knit group where the same people repeatedly discuss the same events with each other, individual memories measurably converge toward a single shared account. In a loosely connected network, the same conversational process instead produces scattered, inconsistent, mutually contradictory versions rather than any single agreed account. The same underlying mechanism, in other words, can either build an accurate shared understanding or lock in a shared error, and which outcome occurs is mostly a property of how the group is connected, not of how careful or honest any individual member is being. People also differ in how readily they take on someone else's version of events: personality traits that predict greater openness to social influence generally predict a person is more likely to absorb another person's inaccurate account into their own memory as well.

Bottleneck Four: Explanations Compete Rather Than Blend

A belief about an isolated fact, such as a date or a quantity, can move up or down continuously as new information arrives. A belief about why something happened does not behave the same way. People do not typically hold a graded, continuously adjustable opinion about causation; they construct a small number of candidate causal stories, each one binding several events together into an account with a beginning, a mechanism, and an outcome, and then adopt whichever one seems most coherent as essentially a package. Strengthening confidence in one causal account comes at the direct expense of the rival accounts, since accepting one story as the explanation is close to mutually exclusive with accepting a competing story at the same time. This is structurally similar to the kind of winner-take-all competition seen in neural population coding, where mutually inhibiting representations compete for dominance rather than smoothly averaging together, a useful analogy rather than a literal mechanism, but a helpful one for building intuition about why causal beliefs feel like switches rather than dials.

A causal story is judged, roughly, on three qualities: whether it is internally consistent, whether it fits with what the person already expects about the world, and whether it feels complete, supplying a clear beginning, a mechanism, and a consequence rather than leaving obvious gaps. Critically, completeness and coherence are not the same thing as accuracy, and a large body of research on how people evaluate explanations finds that a good-enough, coherent story is frequently accepted well before every possible alternative has been considered, particularly under time pressure or when a decision needs to be made regardless of how much uncertainty remains. Under genuine urgency, a merely

plausible, actionable explanation can be adopted in preference to a more accurate but less complete or less immediately usable one. This is not a failure of reasoning so much as a sensible response to the fact that exhaustively comparing every possible explanation is not something a resource-limited system can afford to do before it has to act.

When a causal story is retold, it tends to get retold in a simplified form, following the same tidying effect described earlier for memory in general, so what actually spreads through a social network is usually a shortened, more conventional version of the original account rather than the full, detailed version. And handing someone an entire causal explanation in conversation behaves more like replacing their existing explanation outright than like nudging their opinion slightly, since what is being transmitted is a whole coherent package rather than an isolated, independently adjustable fact.

Why the Distortion Is Durable, Not Just Noisy

If each of these four bottlenecks operated independently and randomly, the result would be noise: beliefs would wander a bit and then settle back toward whatever the evidence actually supported. That is not what happens, because the four bottlenecks interact, and the interaction produces effects with memory in the physical sense, where the same current input can produce different outcomes depending on the system's history.

A belief that survives an early challenge tends to become measurably harder to dislodge with each subsequent retelling, not simply because time has passed, but specifically because it keeps getting actively retrieved and reinforced. A belief embedded in a dense web of other related beliefs, the kind that make up a person's sense of identity or a group's shared culture, costs more to revise than an isolated fact, because revising it would force a costly restructuring of everything logically connected to it, not just the one belief in question. At the population level, a network of people can become locked onto one shared account and fail to return to its original state even after the original evidence that favored that account has faded away, a documented pattern in models of how opinions lock in across social networks. And distinct, mutually incompatible versions of the same story can persist stably in different, separately clustered parts of the same social network indefinitely, rather than the whole network eventually settling on one shared version.

A useful way to hold all of this together: the system is not malfunctioning when it produces a durable, confidently held, and sometimes inaccurate belief. It is behaving exactly as a resource-limited system should be expected to behave once verification, storage, independent confirmation, and explanation are all treated as things the system cannot afford to do exhaustively. Every one of the four bottlenecks substitutes something fast and cheap, engagement, reconstruction, trust, coherence, for something slow and expensive,

verification, perfect storage, independent confirmation, exhaustive comparison. That substitution is what makes ordinary cognition and communication possible at the speed real life requires. It is also, unavoidably, what makes durable, confidently held, and sometimes false belief possible on exactly the same terms.

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