Our Inner Theater

by R. Salvador Reyes [Excerpted from "Narrative Complexity: A Consciousness Hypothesis," Essay #5-Memory & Cognition, pp. 153–160.]

These matters of intelligence—and the rule-building, recognition & application that helps define it—are all mostly about how our brain *uses* memory data, but there are still matters to discuss about that memory data itself. Matters such as our actual *experience* of consciously recalling memories. The most fundamental enigma about the experience of remembering: *what exactly are we watching in our heads?*

Usually when we retell an old memory to others or ourselves, we experience the sensation of seeing this memory play out in our minds—like a little inner theater projecting short films from your past. (Unless you suffer from the *inner imagelessness* of the disorder *aphantasia.*[21]) How does our brain manifest such a depiction? Our visual systems are immensely complex (a result of that ever-increasing importance within our vertebrate lineage) and from our meekly human point of view, the results are nearly *magical*—although research assures us that there is, indeed, nothing magical about it.

From our theory's view of this process, part of that *near-magic* is its ability to "superimpose" very faint images produced from internal dialogue data essentially *on-top-of* (or along with) that much more visually dominant & pristine *actual* environmental data. Because our "Dynamic Core" actively integrates multiple data sources via our pre-frontal cortex in the production of our conscious experience, once our internal dialogue (& its attached *memory-based & very low-fidelity* sensory data) enters that arena, it has fleeting access to those visual systems required to conjure that faint flicker of a narratively-produced image.

The typically extreme *weakness* of this narratively-produced image is why it helps to close your eyes or stare blankly downward when trying to replay these little movies: doing so cuts down on the amount of competing incoming *actual* visual data (closing your eyes) or lessens the attention devoted to competing incoming *actual* visual data (staring blankly). This helps to gives that timid memory-based visual data a fighting chance in its ever-losing battle for our visual resources.

Even when you're retelling a story that you've heard from & happened to someone else, you likely have one of these weak visual depictions running in your mind as you tell the tale. Take a moment to do it yourself: first retell in your mind a quick (but preferably old and not that important) memory from your own past, then follow it

by retelling a quick (but old, not important) tale that happened to someone else. I'll wait... Okay, now think back to those two retellings and ask yourself: were the movies in your mind substantively different in quality? Did your own memory appear in HD while the other only had the quality of a VHS tape? Not likely. More likely is that they appeared roughly the same in your head. *But how could that be?* Isn't one based on actual visual & experiential data while the other is merely a re-constructed imagining? I have some more news that might disturb you: I think they're both essentially re-constructed imaginings.

Once upon a time, your own memory might have been of superior quality, but (assuming you retold an old memory, like you were *supposed to*) this far down the line, that higher resolution has long faded away—primarily a result of that ongoing memory degradation. As proven by our own memory's likeness to the replaying of the other person's story—just because we can "see" a memory in our heads does not mean our inner theater is depicting an actual visual recording of the data.

What happened to our high resolution data? And what are we seeing now when we replay those old memories? What the hell is going on, am I imagining everything? Actually, *sort of*. Look at it this way, for a house fly, perceiving the visual world is an entirely different experience than it is for humans. Does that mean what we're seeing is more *real*, less *imaginary*? Of course not, the fly is looking at the same (and equally real) world, it's just depicting it differently in its sad bundle of nerves that qualifies as its "brain." In other words, we're both merely perceiving or *imagining* the world differently *in our brains*.

Our brain builds (imagines) our visual depictions based on the data available. In our consciousness viewfinder, the world we see is of extraordinary detail because the data input system (vision) and its gush of visual data is directly connected to our viewfinder depiction system. The data available is robust & the system has evolved to perfectly match the data input to its depiction. This is, after all, the depiction system's primary job, and these two systems have been working together since creatures first sprouted eyes.

In contrast, the memory storage system in humans and that visual depiction system are slightly odd bedfellows. Memory storage basically needs to use just a small amount of the depiction system's resources in order to help its data represent this key (visual) element of a moment. And our recollections don't really require those full HD viewfinder depictions. More to the point: they couldn't create them even if they wanted to, because those memory modules don't have nearly enough storage capacity to contain that full gush of visual data we consume in a "real" moment.

This is something we discussed in our essay about dreams. When our memory data is the source of visual depictions, the results aren't particularly impressive. And if we compare the two—visual elements in our dreams and in our old memories—they seem to have essentially the same quality.

Some might mistakenly perceive this concept of a "consciousness viewfinder" depiction as flawed proof that there is within our minds some sort of "homunculus" (a silly-but-persistent philosophical notion that there is "someone" or some essentially metaphysical "self" in our mind that "views" these brain-painted depictions). What I'm intending to describe here is the rich & constantly "refreshing" visual data input that is integrated into a sustained dynamic multi-sensory neural "field" (again, Edelman's "Dynamic Core") whose multi-sensory data is subsumed & analyzed (in a priority-based fashion) by our cognitive systems, which allow us to consciously "perceive" & respond to data presented in that dynamic multi-sensory neural "field." (If it sounds like I'm splitting hairs, it's because *I am*—but the mechanisms of consciousness are definitely a locale where hairs need to be split on occasion.)

The purpose of such a dynamic neural field —and the reason why our wildly complex & fluid consciousness viewfinder ultimately emerged in vertebrates—goes back to those *lamprey eels* and their clever, new capacity to integrate multiple data sources (visual data & electro-sensory data) in the construction of a unified & dynamic internal depiction of their nearby environment. By using multiple data sources to achieve the same goals (essentially, depicting & tracking objects) these eels were able to produce more detailed, accurate & data-rich 3D models of their environment. In order for these multiple & varied sensory data sources to achieve this kind of complex, fluid depiction there must be *some* neural arena in which this simultaneously (& *rapidly*) arriving varied data can be integrated into a unified model—*aka*, some primitive, rudimentary version of Edelman's *Dynamic Core.*

This neural arena is necessary because the *ultimate* goal of this whole process is for the creature to actually physically & appropriately *respond* to what's depicted in their environment. And in order to respond effectively (which, in part, involves *predicting* where something might move *next*) that simultaneous, varied data must be *sequentially* processed in both *temporal* & *spatial* terms. Thus, a dynamic neural field aids this process by helping to unify simultaneous, varied data sources, and then by using those unified neural "moments" to create sequential depictions that track (& in later creatures, *record*) some of that data (*spike* data, which engages a creature's "attention") both temporally & spatially—which is necessary for accurate predictions & physical responses.

These are the roots of our own human *consciousness viewfinder*. And although our highly- & exquisitely-evolved Dynamic Core hardly resembles its early, rudimentary appearance in lamprey eels, *all* versions of this neural arena in vertebrates serve those same core purposes described above. However, it's important to note that just because data *appears* (& is integrated) within this dynamic core/consciousness viewfinder depiction does not necessarily mean that the creature will *respond to* (or *record*) that particular data. In humans, we might think of this as being *aware* of something without actually fully *perceiving* its presence (via our cognitive processes).

The data within this neural arena that creatures are most likely to respond to is that *spike* data, which garners more "attention" (*aka*, is more likely to be sent on to & subsumed by the next step in the data-analysis process). In humans—in addition to being driven by spike environmental data —this "attention" can also be powerfully, rapidly & continually directed, redirected & focused via our internal dialogue mechanisms. And the whole process of perpetually & rapidly redirecting that attention, and equally perpetually & rapidly employing that internal dialogue to note & respond to nearly anything & everything in our purview creates the wonderfully fluid *illusion* that we are actually "perceiving" *everything* that our Dynamic Core is technically *aware of*. (This relationship between our awareness & our attention, and how it affects subsequent data-processing is discussed further in the next essay on *Free Will & The Unconscious Mind*.)

Returning to our consciousness viewfinder's depiction of those *old memories*... If *your own* old memory looked the same in your mind as your memory of *someone else's* story (as it likely did)—what, then, are these images we see in our old memories? And where do they come from? Before we answer those questions, let's look more closely at those recent memories that seem to be in higher resolution. When we replay something that *just* happened, it still has some of that uncanny dream-quality in our heads, but it usually seems to contain much more overall detail than a replay of an old memory (although it's still not an HD viewfinder depiction). *How is our brain doing this?*

I believe our most-recent memories have, essentially, higher resolution "media attachments" that are temporarily associated with the word-based memory data. The reason why it's useful (therefore evolutionarily plausible) to have these temporary, recent high res media attachments is essentially the same as the reason why mundane dialogue hangs around in our head for a brief time before disappearing. Both mechanics help to give us that small window to "go back and get something" or give another pattern sweep to events that we brushed-off when they

first occurred, but immediately require a quick recheck.

As we discussed when exploring pre-human mammalian cognition earlier (those "proto-narrative" structures)—basically, throughout evolution it's been beneficial for our brain to be able to provide a detailed, comprehensive answer to the question: *wait, what just happened?* This is likely because we often don't know the *real* importance of what just happened until we see the result—until *after* it happens. And if "*what just happened?*" doesn't arise quickly, our brain takes that as permission to continue the standard processing of our recent memory-data according to its initial imprint—which ultimately allows most of those recent (and low priority) high res attachments to fade away, leaving more generic attachments to do their job.

What exactly are these high res media attachments & this generic stuff? The difference between these two goes back to associations & data resolution. When we're replaying one of those very recent scenes, its few specific narrative parcels don't have enough capacity in their modules to recreate in detail *every* visual (or other sensory) aspect of that replay. But its recentness means that there are plenty of easy-to-access (temporally-surrounding & closely-associated) memories that haven't faded away yet. And those memories might've focused on those other visual elements not contained in detail in the target scene. These other (likely only temporarily-stored) memory modules serve as high res media attachments: associated neurons that possess some of that relevant more-detailed sensory information.

Thus, when you replay those few, specific, very-recent narrative parcels (the scene), your brain can enhance the depiction with detail from that other closely-related sensory information—which is not actually temporally-simultaneous (and not actually contained in the target scene's few specific narrative parcels). Although none of our memory's version of high res visual data is nearly as robust as the HD viewfinder stuff our eyes process, using several of these focused-but-fuzzy object-depictions can help us to build a broader & more complete (higher res) overall scene than we can using the few focused-but-fuzzies that are contained in the target memory's limited narrative parcels. I know, *huh?* Don't worry, this example should clear things up:

Very soon after my wife came home, I replayed in my mind a specific moment of her arrival in which she walked up the steps & waved to our little girls, who were standing at the big front window. I could see the whole scene: the car she'd just parked in the street behind her, her expression & what she was wearing, what the girls were wearing as they stood in the window. Was it raining? Let me think...yes, it was raining lightly.

This very-recent memory seems full of detail. That detail, however, is likely a result of some *slight of mind*. We have been fooled into thinking we recorded all of these details in the actual scene's few narrative parcels. But these media attachments have likely been built from other surrounding moments that contained the richer detail of each specific element: *the moment when I saw my wife park her car, the moment I saw the girls run to the window*.

In the actual recalled scene—because my wife was the focus of my attention—the informational details of her expression & clothes might truly be contained in those narrative parcels' memory modules. And although the girls clothes & the car were likely ignored (or very *low res*) in the actual moment, during the surrounding moments —when those other elements were my focus —my brain recorded those images in more detail.

And when I think about the rain, *who knows where that data came from*—maybe looking out the window 10 minutes before. Nonetheless, adding it to the replay is a simple matter of the data being requested (by ourselves or others) and our brain judging that it has reliable-enough information to make the reasonable *assumption*, and quickly adding it to the replay. Even though they've come from other sources, these attachments' recentness (thus, their *undegraded-ness*) makes it all slightly more detailed and more convincing than that dreamy, old, unimportant memory I asked you to replay earlier.

If I try to recall the same moment several days later, it's likely that the "dreamy" quality has overtaken that high res memory. *What's happened now?* Now there's no longer any recent, related high res visual data—those media attachments weren't contained in important or retold narrative parcels and have since faded away. Now the replay must rely entirely on the scene's own few narratively-based parcels for its visual data. Because although none of the temporally-surrounding data has survived its half-life, I recalled this one specific scene several times —thus, it's still hanging around & accessible.

Now when I replay the moment, all I mostly have is that already-slightly-degraded specific image of my wife and the narrative framework: the words. And although those words aren't nearly as good as the real sensory data, they can still do the trick. That's because these words can help me to generate "generic" visual data when I replay the moment. So when the words "her car" appear in my retelling, my brain finds the most recent, reliable (thus most easily & likely-to-be-pinged) visual data for "her car" and uses that data to draw-up its dreamy version of her car in the memory retelling.

And if I continue to frequently recall this memory in this specific way, that particular generic car data might become essentially permanently attached to the original

memory—which can be "re-written" little-by-little with each retelling, as the power of each new retelling slightly alters the memory imprints & structures, and their associations (or maybe even lays down an entirely new version of the memory, which eventually gets "first-ping" when the memory is called upon in the future).

Thus, every time I replay the memory later on, her car now continues to be depicted in exactly the same (but still dreamy) way. The eventual consistency of this generic attachment makes it seem like it was a part of the original memory. But it's simply placeholder data that became closely associated to that memory. Keeping this new attachment around long-term is no big deal because it's low-res & by now well-imprinted—thus having none of the drawbacks of the original high res media attachments from those recent, closely-related, but temporally-doomed memories.

Do I have any studies to support this hypothesis that memories are word-based patterns connected to recent high res media or generic attachments, which are primarily a re-imagining of the moment? *Not really.* Although—as discussed at the beginning of the essay—the latest neuroscience certainly indicates that our brains are very *capable* of (& possess the neural mechanisms required for) managing a system like this one. And I do, of course, have some personal anecdotes (very common experiences) that help illustrate these mechanics...

There's a memory I have from first grade that I have retold with great frequency. In short, it's a memory about hurriedly putting on my snowsuit & trying to get to the soon-departing school bus in time. When I tell the story, I can see it in my head: *Mrs. K's room, me leaning against a desk as an exasperated fifth-grader (our bus guide) helps me zip my snowsuit up, imploring me to hurry.* In my mind, the snowsuit is usually beige & hooded.

Would I be surprised if it was actually a beige winter jacket with blue snow pants & a blue hat? Nope—that's entirely possible. In truth, although I *believe* it happened in almost the exact way I describe it—I wouldn't bet my life on it. What I *do* know is that whenever a related topic comes up, these are the words I generally use to retell the story that comes to mind, and these are the images I usually see in my head when I tell it. (In fact, I tend to see—as we often do—this ancient memory from a 3rd-person POV. In other words, I *see* my young self in the memory—which is an obvious tip-off that this movie is being re-imagined.)

This kind of common experience supports the notion that all memories are primarily language-based. Consider that most media attachments' detail—high res or generic—is dependent on what usable, recent, cross-matching sensory data is available to supplement our word-based memory *at the time of that specific retelling.* Therefore, if I'd retold this story when I was in 3rd grade, I might still have a high-quality, relatively-

recent memory of that specific snow suit, and thus the memory's linguistic components "first grade" & "snow suit" would combine to ping a more accurate, detailed version of the suit.

By now, that data is long gone. All that's left are the words "first grade," "snow suit" & "beige," which are more than enough for my brain to create the generic visual item that I've seen in this memory consistently for the last 20 years. Accurate or not, *I still remember* the snow suit, the desk, the classroom. And for most of us, those three words—*I still remember*—are good enough. We'll battle 'til the cows come home in defense of something we *still remember*.

Of course, since each of us has memories that are essentially equally unreliable, your vehement belief in those memories isn't any less justified than the next person's. So go ahead, *swear* you remember. Nobody's really in any position to claim their version is more valid. (Unless, possibly, if that original event was simply *way* more important to them when it first happened—leading that virgin narrative to be both super-strongly imprinted and frequently, accurately recalled).

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FOOTNOTES:

21. Zeman, Adam, Michaela Dewar, and Sergio Della Sala. "Lives without imagery–Congenital aphantasia." *Cortex* (2015).