

# YOUR BRAIN ON STORY

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*This section has been extracted from my two books (Story Proof: The Science behind the Startling Power of Story [Libraries Unlimited, 2007] and Story Smart: Using the Science of Story to Persuade, Inspire, Influence, and Teach [Libraries Unlimited, 2014]) augmented by the findings of a few more recent experiments I haven conducted. I refer you to those two books for a complete bibliography for the material in this section.*

## The Thinking Machine

Ball your hands into fists and hold them together, knuckles touching with thumbs on top and pinkie fingers on the bottom. That's about how big your brain is. No wires, sparks, batteries, silicone chips, or flashes. Just a wrinkly, soft-to-the-touch, lump that is 85% water and weighs typically less than 3 pounds. In other sections of this chapter you'll see how that wobbly glob is organized, structured, and develops. In this section, we'll focus on *what* controls the cognitive magic the brain performs. Consider: everything you do, everything you feel, think, dream, plan, perceive, scheme, imagine, hope, remember, fear, and recall is done by your brain; also, how you react, make sense of the world around you, understand, and create meaning.

The brain has not always enjoyed such an exalted reputation. Ancient Egyptian mummifiers saved what they thought were the important organs (liver, lungs, stomach, and intestines) in Canopic jars that were carefully buried with the mummified body. The brain they pulled out through the nose with something like a crochet hook and threw it away as worthless.

Aristotle believed that consciousness resided in the heart, not in the head. In 1662, philosopher Henry Moore scoffed that the brain showed “no more capacity for thought than a cake of suet or a bowl of curds.” As late as the mid-1700s, scientists believed that thought, intelligence, and consciousness happened almost anywhere in the human body other than in the brain. Some thought it happened in the heart. Others favored the intestines. Some chose the stomach as the seat of human thinking. Others tried to prove that intelligence rested in the lungs. Those beliefs are the origins of phrases such as “Trust your gut.” “Follow your heart.” or “What's your gut reaction?” When first used, those phrases meant “stop and think about it!” It is amazing that so recently, the medical and scientific communities gave virtually no credit to the brain.

We now understand that the human brain is the central controller, processor and creator of all that you do, think, and perceive, and is the most advanced computation and analytical structure on Earth. The central thesis of this section is that every time we conduct research to investigate how the brain performs these wondrous tasks, the answer is **story**.

Story structure controls how we think, how we make sense, how we perceive, how we create meaning from experiences and information, how we remember and how we recall. In this section we will look at how the brain is wired for story thinking and—more practically—what it means for you.

## Peering Inside Your Brain on Story

We begin with the first true scientific experiment into the structure of a story ever conducted in a modern EEG lab. This experiment stretched from May 2012 to June 2013.

Each member of each test audience was wired to a 24 channel EEG system, was fitted with cardio and skin galvanic monitors, and had saliva swabs collected both before and after the story to measure oxytocin and dopamine levels. They looked like guinea pigs in a Mel Brooks version of Frankenstein. Video cameras recorded each person's reactions and movement throughout the story. After hearing the story, each subject filled out a written follow-up questionnaire about the story and its characters, and took part in a short oral interview.

I was able to present slightly different versions of the same story to each test audience. Change character motive for one audience. Change the way I characterize one of the major characters for another. Change the ending point for other audiences. I was able to test dozens of versions of the same story, varying only a few key sentences from the base version for each group.

This testing allowed me to examine the effect of a story (element by element) in a controlled and replicable way. I was able to literally watch which changes created strong shifts in physical and neural reaction, and which did not. I was able to watch exactly how the brain went about its business of struggling to make sense out of this stream of incoming story information.

No one had ever conducted this kind of detailed neural assessment before. Did I find what I was looking for? You bet I did!

## Your Neural Story Net

Evolutionary biologists first proposed this idea back in the 1990s. It has since been extensively tested by developmental psychologists, biologists, and other neural scientists Shreeve (2005), Newquist (2004). 150,000 years of story dominance in how humans interact, communicate, and archive and recall essential information, has **evolutionarily rewired human brains** so that we were all born hardwired to think, to understand, to make sense, in and through specific story terms and story concepts. We showed in the lab that this is physically true. The elements that form the structure of effective stories are literally scripted into your DNA! For more on this important concept see Haven (2009 and 2014), Nelson (2003), Donald (1991), Plotkin (1982), Tomasello (1995), Bruner (1990), or Pinker (2000).

Why are stories so powerful and alluring and engaging? Because that's the way your brain is wired! We are preprogrammed from before birth to seek specific story information when we try to understand and create meaning from the world around us. We think in story form. We make sense in story form. We create meaning in story form. We remember and recall in stories.

Those neural connections link together the sub-regions of the brain that form a fixed network of brain regions devoted to making sense of incoming information in specific story terms. I have started calling this network the **Neural Story Net**—the regions you use to create the specific elements of your stories.

These story-generating subregions of the brain are hardwired together so that they fire together to deal with incoming information. You can see the relevant areas light up on EEG scans. You can see the same areas light up when people are prompted to create stories—one story element at a time. This Neural Story Net (NSN) is the specific part of the subconscious brain that undertakes that initial processing of incoming signals and that then sends “highly processed” information—in story form—to the conscious mind.

We are truly *homo narratus*, story animals. Three key questions remain: where does the NSN sit, what does it do, and how does it do it?

## The Make Sense Mandate

Here are two key research findings that, I think, lie at the heart of the central importance of the Neural Story Net (NSN).

1. Where the NSN sits. Let's say you read something. That information travels as an electrical signal down the optic nerve to the lower back part of the brain (the subconscious or "reptilian" part of the brain). There the signal scatters to almost 30 separate tiny sub-areas that interpret the electrical impulses as squiggly lines, then as letters, words, and then as a visual thing and give it dimension. (Oh, it's a chair, or an apple, or a human. . . .) Other areas try to identify more specific information about it and then send their findings to the *fusiform gyrus*, a small area responsible for basic visual recognition identification (a spider, my friend, a folding chair, my teacher...).

Now this signal goes in two interlinked directions. First, it travels to the *amygdala* (gateway to limbic system) to add emotional response. (Uh-oh. I hate my teacher!) It also lights up the rest of the Neural Story Net that tries to make sense out of this image of your teacher appearing at this time in this sequence of visual images.

Note that this visual image has not yet traveled to your conscious mind in the frontal cortex. It is still rumbling about in the subconscious regions of your brain. The same pattern is true for audio signals.

2. The NSN is that part of the brain that holds the task of initially making sense out of this stream of visual/audio incoming information.

Developmental psychologists have carefully and exhaustively described and documented this supreme drive to make sense of incoming information Hardcastle (2003), Bransford (1993), Pinker (2000). Over the past several years, I have started calling it the **Make Sense Mandate**. Recent research has confirmed that this Make Sense Mandate is an incredibly strong and dominant force in human mental activity. If you can't make sense out of it, you tend to ignore it. At some evolutionary time in the past—and this is the key point—the job of making sense out of incoming narrative and experiential information was assigned to the Neural Story Net. Yes, that hardwired group of story generating sub-regions in your brain—all located deep in the subconscious part of your brain—are required to make sense out of incoming information.

How does the NSN do it? It uses story structure.

Here is the final kicker. If incoming information does not—on its own—make sense to your NSN, those sub-regions of your mind that make up this network rush in to *make* it make sense.

To do that, your NSN is routinely willing to:

- Change (even reverse) factual information
- Make assumptions
- Create new information
- Ignore parts of the provided information
- Infer connections and information
- Infer motive, intent, significance

- Invent new information and detail
- Re-interpret parts of the material, ignoring its original meaning

Your friendly NSN will do what ever it needs to do to make the incoming information make sense to you!

Put those extraordinary findings together and what do you get?

1. The NSN lies *between* your sensory organs (eyes and ears) and your conscious mind. Nothing reaches your conscious mind (and your memory) without first being massaged into story shape by your NSN.
2. You turn all incoming narrative and experiential information into story form *before* it reaches your conscious mind.
3. What reaches your conscious mind is always your own story-based interpretation of what your sensory organs actually recorded.
4. When someone presents a program, speech, or even a simple talk to you, the story you hear and see in your conscious minds **is not** the story that person said! Your conscious mind hears the story your own NSN created *based* on the story that person actually provided.

Here, then, is what first reaches your conscious mind—and what you think is *exactly* and accurately what that other person said or wrote:

**What first reaches the conscious mind is a self-created storied version of the original source material, altered (distorted) from that original in order to make it make sense to your NSN.**

Research over the past decade has shown that when you use “effective” story structure, you minimize the distortion created by the NSN of your intended audience. The story (and the associated information) that arrives at the conscious mind of your audience is both much closer to, and more accurately reflective of, the version you actually delivered.

That is an amazingly important statement for me to be able to make and the science is there to back it up. If you craft your stories based on the elements of effective story structure, your messages, your themes, and your information will arrive more accurately into the conscious minds and memories of your intended audience.

The Make Sense Mandate is an incredibly powerful force in the minds of every person with whom you want to communicate. It is driven by the Neural Story Net’s story-based structure and it dominates the way every living person interacts with, and interprets, the world around them.

### **Tapping Your Mental Vault: The Role of Prior Knowledge**

Your Neural Story Net needs to short-cut its way through the maze of possible interpretations of incoming information—and do it long before it receives adequate information from the source. How? It makes assumptions. The human NSN is a world-class champion at leaping to assumptions.

This introduces another questions: Where does the NSN seek the information it needs in order to make those assumptions? The answer to that question is: prior knowledge.

What you invent, infer, assume, and project comes from your cumulative experiences: from you **Banks of Prior Knowledge**.

By definition, your Banks of Prior Knowledge are your, “sum total banks of existing knowledge and experience about a relevant topic”—everything you have learned and experienced, what you know and believe. You dredge information from your Banks of Prior Knowledge in order to fill in gaps in the incoming information and patch together a coherent and meaningful story.

As new information arrives from your eyes or ears, your mind calls down to your memory vaults for someone to check the files on this particular topic. That runner opens the right file drawer and thumbs through the mental manila folders until he reaches the one corresponding to the informational topic at hand.

The runner races back out of your memory vault and hands the folder over to your processing center. If that folder is empty, you say, “I don’t know anything about this topic,” and tend to use that as an excuse to ignore the incoming information. If the folder contains information, you use that existing information to create **context** for the new stuff. (**CONTEXT**: “The surrounding parts that determine meaning; background.”) Context defines how this new information relates to what you already know and believe.

You use these same banks of prior knowledge to decide if this new information is **relevant**. That is, if it is significant to you, if it likely means something to you, if it is *important* to you. (**RELEVANCE**: “Implying close relationship or importance.”) Research studies suggest that, if you lack context and relevance for incoming information, you are unlikely to pay attention to it. Other studies show that context and relevance are critical to accurate memory and recall (Haven, 2009).

## **The Eight Essential Elements**

You will find that the core ideas behind these elements are common to many texts on storytelling and to the opinions and approaches used by most storytellers. My goal was to use EEG and fMRI experiments to map the NSN and to identify which elements the human Neural Story Net requires as it performs its Make Sense Mandate. I uncovered eight of these essential informational elements that the NSN uses to create the story-based versions of incoming information that it sends to the conscious mind. These eight are:

### **Element #1: Characters**

Stories are about characters, not plots. Always have been; always will be. Stories are not about *what* happens, but about the *characters* to whom that stuff happens. Audiences won’t care about events and information until they care about the characters involved in those events. Once they care about the characters, almost anything can happen and the audience stays hooked.

Let’s start with the basics. What *is* a character? Here are five key characteristics that separate characters from things and objects:

An effective story character **must**:

- be a **physical** entity
- be an **individual**

- possess a **will** (be able to think and form intent and self interest)
- be capable of **acting** in support of that will
- be able to **communicate** (express self)

Question: What makes a character *interesting*? Take “interesting” literally: **being of interest**. You want audiences to be interested enough in your main story characters to file them into active memory and remember them, and to want to find out what happens to them. If audiences find your characters to be of interest, they will pay attention to your story. If they don’t, they won’t. Being interested in a character is different from liking that character. Despicable villains are normally quite interesting.

The answer: *any* descriptive information can make a character interesting (including having two arms or being nice) as long as it differentiates this character from those around him/her. What makes a character interesting is any information that makes that character different, unique. Such information allows the audience to mentally tag and hold that character for future reference.

Bottom line: *If you want listeners to pay attention to **your message**, create a **relevant and interesting character** for them to identify with.*

## **Element # 2: Character Traits**

Character traits are really just details about characters. Traits are information you share about your characters that is independent of their actions and involvement in the story. If a character lies during a story, that is an action. How they feel about having lied would be a character trait. If they lie most of the time, that’s a character trait. Character traits reveal the character hidden under the skin.

Here are what my experiments found to be the most consistently useful categories of information to scan through to search for a couple of interesting tidbits that will make your characters interesting: their history (back story), physical characteristics, jobs and hobbies, hopes and dreams, talents and abilities, likes and dislikes, passions, attitudes and beliefs, voice, fears, and habits & quirks. Any information that is unique, unexpected, unusual in these categories will do nicely.

## **Element #3: Goal**

By definition:

**Goal: what a character needs or wants to do or get in a story.**

Goal is not what they do; not what they actually accomplish. It is what they are after, what drives them. This one critical element of story information also allows readers to understand the point, purpose, and structure of the story.

From neurophysicist, R. Montague (2006): “Remarkably, the single property that all biological and mechanical computational systems require is goals.”

Famed researcher, Pinker (1997) agreed that beliefs and goals drive behavior. But Pinker went further showing that, if we are to truly understand behavior, we must first understand beliefs and goals. In the lab I showed that:

- 1. Stories end when the primary goal of the main character is resolved, one way or the other.** Why do they end there? It is not because that is the way the world works. It is that the NSN demands that a story will end when the primary goal of the main character is resolved—one way or the other.
- 2. Every action and event in a story is interpreted by receivers based on its impact on a character's ability to achieve goal.** A known goal creates meaning for the events in a story.

Goal is a hugely important element of story information. Goal establishes the point and purpose of a story for the receiver's Neural Story Net. It creates the basic framework of story structure. No goal: no way to establish personal relevance and meaning; no way to get listeners to become deeply and personally invested in the characters and in the story; no way to get excited about, or to understand, story actions and events.

#### **Element #4. Motive**

Motive is the most underrated, overlooked—and one of the most powerful—of all of the Eight Essential Elements. By definition,

**Motive: the information that makes a goal important to a character**

Motives are the answer to the question, “Why do they need to reach that goal?”

Motives give a character compelling reasons to struggle to reach a goal. While it is important to make *goals* tangible (and, thus, easy for audiences to visualize), no such restriction applies to motives. Motives commonly relate to the human condition: loyalty, faith, belief, peace on Earth, fairness, justice, self sacrifice, family, right-versus-wrong, greed, selfishness, lust, avarice, laziness, etc., etc.

Motive is one of the first things each person's NSN invents if the source material (the story) doesn't provide it. In recent studies, test audiences a) are almost always “wrong” when they infer motive, (That is, the motive they infer does not match the motive the writer intended.) and, b) they consistently created more sinister, negative, motives when left on their own than were intended or envisioned by the story's creator. How often have you found yourself skeptically wondering, “Why did she say *that*?” and “What is he *really* after?” and “What is he *hiding*?” during a conversation? That is your NSN seeking a motive in order to make sense out of the incoming information.

Motive, in conjunction with goal, also create basic story suspense. Suspense is an emotion. Suspense and excitement are the two main drivers of story tension. Tension is what forces readers to push on through to the end.

Neuroscientist V.S. Ramachandran (2004), said “Most of our behavior is governed by a cauldron of motives of which we are barely conscious.” But our NSN's certainly are forever on the hunt for motives that lie behind and explain the behavior of those around.

The greater the motive, the more that story motives shift a goal from a “want” to an “absolute critical need,” the greater the story suspense.

#### **Element # 5: Conflicts and Problems**

Stories happen *on the way* to resolving goals. Once you reach goal resolution, the story is over. That means that something must initially be keeping every character from reaching his/her goal. If nothing blocks them, they would already have achieved their goal.

There are only two things that can block a character from reaching a goal: problems and conflicts.

- 1. Problem: A problem is anything that blocks a character (even temporarily) from reaching a goal.**
- 2. Conflict: A conflict is a problem that places a character in direct opposition to some other character or entity in a story.**

Story problems serve the story by acting as obstacles blocking a character from a stated goal. For the story to make sense, the problems you include must serve as obstacles that block (even temporarily) a character from resolving a goal.

“Problem” is the general, catchall term. “Conflict” is a specific subset of problems. Every conflict is a problem. Many problems do not create conflict. Having five miles to walk to reach your car, for example, is a problem (It temporarily blocks you from reaching your goal.) But it doesn’t spawn any conflict. We separate conflicts into its own pullout category because of the markedly different affect conflicts have on human perception.

The hardwiring of your NSN assumes obstacles always exist and seeks obstacles that stand in the path of goal resolution. If you include problems that don’t serve that function, it forces listeners’ NSN’s to either invent a connection that could make the problem relevant, or partially pull out of the story to ponder whether they need to hold onto these asides or if they can disregard them all together.

Finally, notice that, without an established goal, the problems and conflicts you mention cannot hope to engage, excite, or involve an audience. Problems are only relevant within a story structure when they serve as obstacles between character and goal.

No problems; no conflicts: no story.

### **Element # 6: Risk and Danger**

The truth is that problems and conflicts do not, themselves, create excitement or tension in a story. What does accomplish that key story function? The two things that obstacles can create for a character: risk and danger.

**Risk: The probability of failure; the likelihood that something will go wrong.**

**Danger: The consequences of failure; what happens if something does go wrong.**

Risk and danger are the drivers of excitement, tension, and drama. The risks and dangers that accomplish that heroic feat are created for the main character by the problems and conflicts they have to face and struggle to overcome.

Risk and danger are what lock us into a story and make us need to find out what happens. Risk and danger make your characters compelling and sympathetic. They make story readers want to identify with your characters. Said in gambling terms, if a player puts nothing on the table, how can we possibly care about what cards they are dealt?

In virtually every moment and situation we, like a radar station on a Navy ship, probe the surrounding waters, performing risk and danger assessments. Every audience member's brain is used to working with risk and danger information. Your Neural Story Net requires it in order to evaluate individual events, the story in general, and—more importantly—your characters. If the teller fails to provide a description of the risk & danger a character faces, each listener's NSN will be forced to invent (infer) that information on its own.

Excitement = Risk x Danger

Tension = Excitement + Suspense

According to the saying: **As goes tension, so goes attention!**

What kind of risks and dangers? Any and every type of danger is worth considering and developing: embarrassment, rejection, ridicule, belittlement, being laughed at, abandonment, failure, being scorned, being unwanted, lack of results, fears, losing your self image and self worth, destitution, losing your self respect, making an error, injury,, pain, death, etc., etc.

### **Element # 7. Struggles**

If a story includes these obstacles and lays out the associated risks and dangers, you need for the story characters to confront those obstacles and to face those risks and dangers.

What you need, is for the story's main characters to **struggle**.

**Struggle: to contend, to engage, to exert a great effort, to fight, to stand against, to oppose**

Readers will never appreciate success without first seeing and vicariously experiencing the struggle to overcome great problems and conflicts, facing great risk and danger, to reach an important goal. That's the essence of effective stories.

Any kind of struggle will do: internal or external.

Don't feel that having to struggle is a sign of weakness. Struggle is a strength. It is a virtue. More importantly, it is a critical story asset and element if your audiences' NSN is to understand and make sense of this story as you intend for them to do.

### **Element # 8: Details**

Story details create pictures in audience minds. Every image you have ever "seen" in your mind and memory when you heard or read a story came from the details. We create stories, but we write details: character details, sensory details, scenic details, and event (action) details.

Audience members use the details you provide as a substitute for their own direct sensory observations—what they would see, hear, smell, taste, and touch if they physically experienced the story. Those pictures create a sense of reality in your mind. They make (allow) you to believe in the

story as if you had personally experienced it. Studies have shown that you activate the same parts of your brain when recalling a story that you do when recalling a similar real-life experience (Anderson, 1993, Barrs, 1992, Braun-LaTour & Zaltman, 2006).

In a story, details act like theater spotlights, directing audience attention around the story. Details control what the audience sees, and what they **don't** see. Where you include rich story details at one story moment, it is just like turning on a stage spotlight. The audience pictures that moment in the story. Leave out the details and it is exactly like leaving off the lights in a theater. The audience overlooks that part of the stage or that moment in the story.

In this way, details allow you to control your audiences' minds. How? By allowing you to control the images, the pictures, they focus on, vividly visualize, and file into memory.

One caution. Details don't come for free. There is a price to pay for spraying vibrant details throughout your story. Each detail slows the pace of the story a tiny bit. Each one sucks a tiny bit of energy (excitement) out of the story. You need to include the details. But you want to pay the smallest possible price for the story benefits they bring.

It is a form of cost-benefit analysis. You want to get the greatest image "bang" for every energy and pacing "buck" you have to pay. How? Work on each detail to wring the greatest possible imagery out of every word. Strive to make each detail more specific, unusual, unique, and vivid.

## **The Eight Essential Elements on Parade**

Those are the Eight Essential Elements. Those simple informational bits match the core informational mandates of the Neural Story Net as it struggles to fulfill its Make Sense Mandate. The NSN will obtain and use those specific informational pieces—either from you and your material, or by its own invention, using its own Banks of Prior Knowledge.

### **The Eight Essential Elements of the Story Structure**

- |                                     |   |
|-------------------------------------|---|
| <b>1. Characters:</b>               | The characters that populate essential character positions in the story.  |
| <b>2. Traits:</b>                   | Selected elements of character description used to control receiver attitude toward, and relationship to, story characters.   |
| <b>3. Goal:</b>                     | What a character needs/wants to do/get in a story.  |
| <b>4. Motives:</b>                  | The sets of drivers that make a goal important to a character. Goals and motives are the primary source of story suspense.  |
| <b>5. Conflicts &amp; Problems:</b> | The sets of obstacles that stand between a character and an established goal and block that character from reaching the goal.   |
| <b>6. Risk &amp; Danger:</b>        | The likelihood of failure (risk) and the consequences of failure (danger) created by problems and conflicts that a character must face. Risk & danger are the primary |

source of story excitement. Excitement and suspense are the primary sources of **story tension**.

**7. Struggles:**

The sequence of events a character undertakes (struggles) to reach a goal highlighted by the climax scene (confrontation with the last & greatest obstacle) and the resolution scene.

**8. Details:**

The character, sensory, scenic, and event specific descriptors used to create, direct, and control receivers' story imagery.

From neural story science discoveries, it is now possible to provide a rational, practical definition of what we *really* mean when we say, “good story,” or “*effective story*.”

***Effective story structure is: that character-based story organization that uses the Eight Essential Elements to provide the information required by the Neural Story Net in order to understand and to make sense.***

Remember, these Eight Essential Elements:

- Exactly match receiver neural information demands
- Explain how listeners hear and make sense
- Are the best guide to effective stories
- Control engagement
- Are the gateway to influence

That is just how simple, common sense, and basic the Eight Essential Elements are that control the operation of every person's Neural Story Net. And that makes them well worth your consideration as you plan, mold, craft, and edit your narrative material.

**A Final Thought**

There is a clear implication to the advances in neural story science over the past few years. This is something storytellers have long claimed. However, we have always meant it metaphorically, symbolically. Our research findings mean that we can state it physically, factually, and biologically.

***Story is scripted into our DNA***

DNA scripting directs our developing brains to create a Neural Story Net and to strengthen it into a dominant part of our thinking and interpretation mental apparatus. DNA scripting preprograms us to make sense, to think, to learn, and to remember all in specific story terms. DNA scripting creates our predilection for stories and storytelling.

We are story. Story is us. It is woven into the most basic fabric of human life. We are story animals. The value of the science of story is that it makes clear and specific this inseparable linkage between storytelling and being human.

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