Houston, We Have a Narrative

"How would you like to share your communication ideas with an audience of 1,000 eager minds?"

That was my friend Megan's invitation, asking me to take part in a panel discussion at a 2013 meeting of ocean scientists in San Diego. It's the sort of activity I do these days. I used to be a scientist, I became a filmmaker, and now I work with scientists helping them communicate more effectively with the public. I could hear the excitement in her voice—it was a chance to present my work on communication and storytelling to a large and interested crowd. It sounded good, so I agreed.

As the summer went by I didn't give it much thought, then about six weeks before the event I looked at the meeting website to see what I had signed up for. There were two other panelists, both of whom I know and who are more than ten years my senior. But more importantly, they are two of the world's top experts on the subject of sea level rise—something I know virtually nothing about. Furthermore, looking at the title of the panel, "Responding to Sea Level Rise," there was no clue where I, the scientist-turned-filmmaker, fit in. The event felt like "Two Great Scientists (plus this other guy)."

I said to myself, "Houston, we have a problem."

I called Megan and asked if there was a reason why she had put me on a panel for something I know so little about. She said, "Yes, yes, yes—these guys are dying to work with you. They want you to use your storytelling knowledge to do makeovers on their presentations."

We talked it through. By the end I understood her idea and it sounded cool—a chance to implement the teachings of my books and workshops on the need to tell better stories. Great!

I set to work writing an email to the four of us, laying out my initial ideas. I would reshape the scientists' material into a set of stories they and I would tell, taking turns presenting different parts. It seemed perfect . . . until the scientists replied.

There was immediate pushback. One of them said that his presentation was already set—he had been giving it for over a year—everyone loves it. Basically, it's not broken, no need to fix it, thanks. The other was in Europe and said he didn't have the time for changes.

I pushed a little harder, explaining my ideas further, including how the team presentation style would add energy to the normally dull panel format. They didn't seem to like my labeling things as "normally dull." And did I mention they were ages 68 and 70?

"We just don't need it," one of them wrote. But of course I ignored that. I was still sold on Megan's enthusiasm, so I did what I always do—I kept pushing. Finally the truth started coming out.

"Look," one of them replied, "both of us are known as good speakers. We're very busy. We'll show up and give our standard talks. It will be fine."

I shot back, "I know, but what I want is more than 'fine.' With the power of narrative we can reach a higher level and give the crowd an event to remember."

"I just don't see how it's going to work," his next email said. "You're talking about us taking repeated turns speaking. We'll be

getting up and sitting down, bumping into each other—it sounds like a mess."

I replied, "No, trust me, the audience will appreciate the energy of the team effort. It shows we're listening to each other."

And then . . . well, there were a couple more exchanges, until one of them finally said, "Randy, all of us have given countless numbers of these talks. We *all* know how they work. We *all* have the same amount of experience. There's just no need for what you're describing."

And that was it. A moment of realization for me.

Presentations given by scientists, administrators, students—pretty much anyone—are very, very personal. They are an extension of the speaker's inner being, an expression of the ego. In this age of TED Talks, everyone is working on their presentations—running them by their friends and family, honing and shaping them. My asking to get in and mess with others' presentations is like asking to come over and reorganize their underwear drawers. It really is that personal.

I could sense I had hit the limit. An eruption was approaching. Which meant it was time to end it by showing how hopeless the predicament was. I did this by tossing a hand grenade into the discussion so there would be no lingering doubts.

Drawing on my most condescending tone, I replied, "Eh hem . . . only one of us has over two decades of mass communications experience . . ."

I hit SEND and waited less than two minutes for the nuclear missile I knew would come back, which it did, in the form of a short email that began,

> "Well, Randy . . . . . aren't we special. I suggest you check yourself before this entire event unravels."

There was more to it that was even worse. I sat there looking at my computer screen thinking, "Whoa . . . , " and figured that was

enough. I didn't reply. Instead I was breathing deeply as I headed out the door for a cooling-off jog.

I thought about what I was trying to do. These two guys were the sources of knowledge—they were the ones who actually knew something truthful about the real world. I was this horrible agent of conformity wanting to reshape their words and information, to transform the real world into the narrative world.

This same shaping process happened with the iconic quote from the Apollo 13 mission to the moon. The original words spoken by astronaut Jack Swigert in 1970 when an oxygen tank exploded on board were "Houston, we've *had* a problem *here*." But 25 years later, when Tom Hanks delivered the line in the movie version of the events, the words were "Houston, we *have* a problem."

What changed and why? Two things. The Hollywood folks made the line more concise (fewer words) and they made it more compelling (present tense makes it more urgent). I wanted to do this with the scientists—keep things accurate yet make them conform better to the constraints of the narrative world in which we live.

But this sort of text manipulation worries scientists. They want people to know how things are in the real world, and they dream of simply being able to "see it, say it." They want to tell you the truth, exactly as they see it, without having to rearrange anything, because the rearranging process can be dangerous. Rearranging things comes with risks—at the mildest just getting it wrong, at worst deceiving people.

But the problem is, "see it, say it" doesn't work. Not even in the world of science, as Nobel laureate P. B. Medawar first addressed in the 1960s with his essay "Is the Scientific Paper a Fraud?" He agonized over the transition that must take place, where scientists have to give in to a third step, ending up with "see it, shape it, say it." This is what scientists do every day in the process of editing their scientific papers.

Yet the strange thing is that, despite having made major concessions over the past century to this need to shape things, scientists

still have little awareness of it. Let me tell you about a little experiment I've run to demonstrate this lack of awareness.

IMRADical

I like to ask a question of large audiences of scientists. I ask if they know the meaning of a certain acronym. The acronym underpins the narrative structure to which almost all scientific journals conform. It is a piece of knowledge that is as central to the lives of scientists as the names on their driver's licenses are to their daily lives.

Speaking to a group of more than 800 scientists at the annual meeting of the American Society of Agronomy, I asked for a show of hands: "Who knows what this acronym means?" I then put up a slide that said simply "IMRAD."

No hands went up. I chuckled, pulled out my cell phone and took a photo of 800 pairs of unraised hands to document the moment for posterity (as well as for any disbelieving scientists, of which I'm sure there are plenty).

Then I asked a second question: "How many of you have ever read a scientific paper that was broken into four sections labeled Introduction (I), Methods (M), Results (R), and (A) Discussion (D)?" By the time I reached the "R," you could hear the chuckles and comments of "Ah, ya got us!"

They have all read hundreds, thousands, tens of thousands of papers that conform to this structure. IMRAD, as I will tell later, was hammered out a century ago and eventually accepted as the standardized structure for how a scientific report is best presented. It is simple in form and essentially identical to the three-act structure that is at the heart of virtually every movie or play written today. It is the structure of a story, which has a beginning (I), middle (M&R), and end (D).

Yet there were no hands raised. And as if to show that it is the exception that proves the rule, it turned out there actually was one

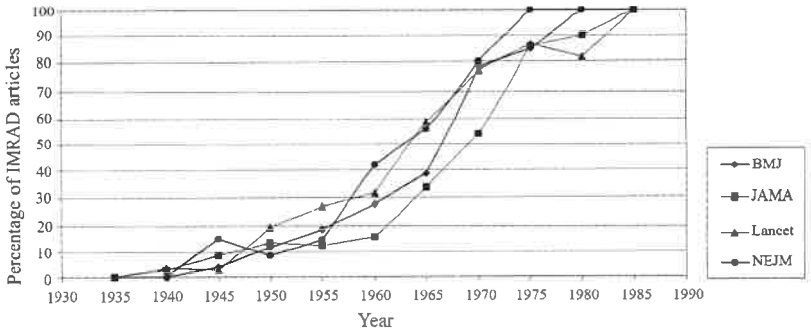

Figure 1. The gradual adoption of the IMRAD Template in biomedicine. We all know today it was the definition of a good idea, and yet . . . look how long it took for the IMRAD form to be adopted completely in the four top medical journals (from Sollaci and Pereira 2004).

hand, way to my left, that was raised, which I noticed only after the second question. Everyone on that side was pointing to him saying, "Here's one!"

I called on him. It was Josh Schimel, author of the popular book *Writing Science Papers: How to Write Papers That Get Cited and Proposals That Get Funded*." He knew the acronym, of course—his book has an entire section on it. But he was the only one.

I did the same stunt with about 200 doctors and students at Johns Hopkins Bayview Medical Center. Same result. Zero hands raised. I've also run the acronym by all of my scientist friends. Nobody has ever heard it, even though there is an entire body of literature around things like the history of IMRAD, the power of IMRAD, the uniformity of IMRAD, and so on. I myself was a scientist for 20 years yet only learned in the past year that there is a formal label for this text structure.

IMRAD: So What?

Okay, big deal, so a bunch of scientists didn't know the acronym that describes the structure of their papers—knowing the IMRAD label is not necessary in order to use it. But what matters is what

this reflects. Science is a profession that is permeated with narrative structure and process, yet scientists are so blind to the importance of narrative that they don't even make use of this established label.

If narrative were held up as important, all science courses from the first day would say, "Our profession is so completely built around narrative dynamics, we even force scientists to comply with a narrative template known as IMRAD, which you need to learn about." They might even go on to say, "Narrative and story are pretty much the same thing, which means over a century ago scientists accepted that story is at the heart of their profession. Which means there is no reason for you to have any irrational fear of story." (This last bit might help with the problem of "storyphobia" I discuss in chapter 11.) But none of this happens.

Now you might ask, "So what is at stake if the science world isn't aware of how ubiquitous narrative is and how it works?" The answer is, everything.

Problem 1: Exaggeration Nation

I'm going to use the term "narrative deficiency" to refer to the general problem this book addresses: not enough comprehension of narrative and how it works. Narrative deficiency might not be much of a problem to a plumber or an air traffic controller, but in science, narrative is everywhere. If you don't understand narrative, you don't fully understand science. Let's look at how pervasive it is.

Science consists of two major parts: the doing of science (research using the scientific method) and the dissemination of information about what was done (communication). Both suffer the consequences of narrative deficiency.

On the research side, there are only two outcomes to scientific studies. Either they produce positive results (we saw a pattern), or

they produce null results (we didn't see any pattern). The positive result is the same as telling a good story (we saw something!); the null result is equal to telling a boring story (sorry, we didn't see anything, zzz . . .).

The problem these days is that everyone wants to tell good stories while nobody wants to tell boring stories. The journals want to tell good stories, the scientists want to tell good stories, the outreach staff want to tell good stories, and the journalists want to tell good stories. It ends up being a conspiracy of good storytelling. Which can be bad.

In 2014 Petroc Sumner and his colleagues demonstrated the seriousness of this problem for health sciences. They examined biomedical press releases from 20 major UK universities versus the published research papers upon which the releases were based. They found that 40 percent of the press releases contained exaggerated advice, 33 percent contained exaggerated causal claims, and 36 percent contained exaggerated inference.

That's a whole lot of exaggeration, leading to the telling of bigger and more exciting stories than what actually exist in the real world. This is bad news for science, which seeks to document the real world, regardless of how good the story.

This is where I need to be clear on what I'm advocating with this book. It is essential that every scientist understand what makes for a good story. A lot of what I will be presenting will help you achieve that goal. But advocating this understanding is not the same as saying you should necessarily tell only "good" stories.

The problem of good storytelling run amok crops up in the form of what are called "false positives"—seeing a pattern when there isn't one. For example, let's say you announce to the world that ice cream causes cancer when in fact it doesn't (a false positive result). Such a report would probably put you on the front page of newspapers everywhere. People would be excited—the journal in which

you report it, the outreach folks at your university, the journalists who shape your work into a form for the general public—all revved up. It is enticing and will bolster your career. But what if it's not true? What if it's a false positive and ice cream doesn't cause cancer?

In contrast, if your study concludes from the start that ice cream does not cause cancer, about all you'll get from the newspapers will be a big "duh."

This sounds silly, but it's the state of the world in science today. The proliferation of false positives is anywhere from a significant concern in some fields to out of control in others. Specifically, the field of biomedical research knows it has serious problems. In 2013 John Ioannidis, MD, of Stanford University, who has become famous as the chronicler of the current false positive plague in the biomedical world, announced, "Most of the claimed statistically significant effects in traditional medical research are false positives or substantially exaggerated." Notice he didn't say "some." He said "most."

On a similar note, a prominent geneticist I spoke with recently said, "Pretty much all the papers published these days in *Science* and *Nature* in my field are overstated."

Randy Schekman of the University of California, Berkeley, in his acceptance speech for his 2013 Nobel Prize, even went so far as to announce his own personal boycott of the top journals, saying that he and members of his laboratory would no longer submit their papers to the three most important scientific journals, *Science*, *Nature* and *Cell*. He did this because he feels the criteria for acceptance has been based on "significance" (how big is the story the paper tells?) rather than "soundness" (how well done is the research?).

Is the proliferation of false positives a disaster? Probably not. But it is definitely a significant problem and, according to every scientist I spoke with in the writing of this book, one that is growing.

Furthermore, it has become increasingly clear that, at the same time scientists are reaching for big headlines, scientific journals are less interested in publishing research that doesn't produce big headlines. In 2014 Annie Franco and colleagues published a paper in *Science* titled "Publication Bias in the Social Sciences: Unlocking the File Drawer." They showed how extensive the discrimination against null papers is in at least one field. They found that for the social sciences, null studies had a 40 percent lower chance of being accepted for publication, which in turn translated into a 60 percent lesser chance that the investigators would even bother sending them in to be published—thus their reference to "the file drawer," which is where so many null studies end up languishing.

The bottom line is that positive studies tell big stories and get published; null studies tell small stories and have a hard time getting published. This is all a function of narrative dynamics, meaning how stories are told. It's all the same thing.

One would hope the world of science is accurate, but unfortunately the scientific literature gets pulled away from accuracy by the allure of prominent positive results and discrimination against null results, both of which affect narrative dynamics. (By the way, note the second word in "scientific literature.")

Problem 2: Numbed Down

For the other half of science—the communication of research findings both among scientists and to the general public—the problems are age-old. It's the struggle of connecting with an increasingly numbed populace. Scientists are famous for being bad communicators. I documented this in 2009 with my first book, *Don't Be Such a Scientist: Talking Substance in an Age of Style*. I pointed out the difficulties of communicating information-heavy material. The book was well received, along with several other similar books such as *Am I Making Myself Clear?* by Cornelia Dean, *Escape from the Ivory*

Figure 2. The Narrative Spectrum. Too little narrative content, you're boring; too much, you're confusing. But there's an optimum where you achieve the goal of effective communication.

Tower by Nancy Baron, and *Unscientific America* by Chris Mooney and Sheril Kirshenbaum. The general reception from the scientific community was a collective response of "We know, we're working on it."

The costs of poor communication range from students getting bored with their science classes to the inability of the scientific community to deal with the growing antiscience movements for subjects such as climate science, evolution and vaccination policy.

More analytically, we can look at the communication problems in terms of narrative structure. Eventually I'm going to get into plenty of detail on this, but for now let me just offer it in simple terms. There is an optimum for narrative in communication. There is a certain amount of story complexity that is enough to be engaging, but not so much as to be confusing. It's pretty much that simple.

The same sort of optimum exists for Hollywood movies. Just look at a hugely successful recent movie like *Gravity*. The movie had one main character (Ryan Stone, portrayed by Sandra Bullock), one main incident (the debris cluster damaged her spacecraft), and one clear goal (to get home alive). It didn't have 15 stories happening at once, but just the same, it definitely had one very good story happening. The basic elements were simple, but out of her simple predicament arose all sorts of story complexity. The same dynamic is ideal for both scientific research and science communication.

Figure 2 shows this in terms of a spectrum. Some people don't have enough narrative content in what they are saying and they

get boring. Other people are trying to tell you multiple stories at once and you can't follow them, making them confusing. And then there are some people . . . they just have a sense for the right amount of narrative. That intuition in Hollywood is referred to as "story sense." For our purposes, I'm calling it "narrative intuition." Developing this intuition needs to be the ultimate objective for the science world.

I titled the most important chapter of *Don't Be Such a Scientist* "Don't Be Such a Poor Storyteller." I ended the book by pointing in the direction of narrative as the way to address these problems, but I had little specific advice because I had not done that much work on narrative myself.

I followed that book by recruiting two veteran actor friends, Dorie Barton and Brian Palermo, to create a workshop to address this challenge. Over the next four years we taught our Connection Storymaker workshop to a variety of science and environmental organizations, eventually culminating in 2013 with our book *Connection: Hollywood Storytelling Meets Critical Thinking*. The workshops led me to the specific tools and advice I'm presenting here.

My overall conclusion is that the world of science, although steeped in narrative, is largely oblivious to the power and importance of it. This needs to change. And I know who has the knowledge to make the change possible.

Hollywood: Savior of Science?

Right now countless scientists are suppressing their gag reflex after reading this heading. You might be one of them.

In general, Hollywood is anathema to science. Scientists hold the truth as their highest aspiration. Hollywood views the truth as an optional add-on that can be fun if it's convenient. Hollywood's general attitude is reflected by one of the greatest screenwriters

of today, Aaron Sorkin. Commenting on his movie *The Social Network*, he seemed to be speaking for the entire industry when he said, "I don't want my fidelity to be to the truth; I want it to be to storytelling."

That is so beautifully put. And I guarantee you it produces everything from shivers to rage in scientists.

Actor/director Ben Affleck put a finer (and even laughable) point on it when he defended his movie *Argo*, which was based on historical events, as having "a spirit of truth." And that's about where you completely lose the entire science community. There is no "spirit of truth." Either something is true or it isn't. Ah, Hollywood.

I share some of this revulsion. I was a scientist. I still have 49 percent of my brain that is programmed like a scientist's. I feel their pain. And yet, there comes a time . . .

Science now needs something that Hollywood has. It's not the ability to make large glitzy action movies that use science to titillate while distorting all the good work of so many humble people. I have little use for those big dumb movies, and I don't think the science world should hold out too much hope for them.

I'm talking about something much deeper. Not the output of Hollywood (what they produce) but rather the process (how they create it). It's the power of narrative. Hollywood is the place that has figured out how narrative works in the real world. Lots of humanities scholars can babble on endlessly about their theories of narrative, but most couldn't spot the basic principles at work in our lives. It's the people in Hollywood who have cracked the code of narrative over the past century, thanks to the driving force of financial profit. Science now needs their help.

Think about it in *Silence of the Lambs* terms. Science, in the form of Agent Clarice Starling, needs to slowly, apprehensively walk down the long, dark basement hallway lined with maximum security prison cells. In the distance is Hollywood, in the form of Dr. Hannibal Lecter, locked up in his cell, glaring insanely through

his mask, eyes twitching right and left. Clarice may despise Lecter, but the fact is, she needs his help. He has the knowledge. The time has come to set the prejudices aside—the problems are now far more important than worrying about where the solutions come from.

This is the conclusion I have come to at the end of a 40-year journey. I began my professional life as a scientist. I achieved tenure as a professor of marine biology. But then I changed worlds. I moved to Hollywood, attended film school, worked on movies, made movies, and eventually premiered my movies at the Telluride and Tribeca film festivals, among others.

The journey has led me to focus on the narrative problems of the science world. I firmly believe Hollywood holds the great knowledge that science needs to master. It's time to talk to Hannibal Lecter.

Or if not him, then at least Eric Cartman.

Eric Cartman to the Rescue?

The need to address the problem of narrative deficiency was my big revelation. And who exactly, you might ask, brought me around to this? The answer is simple—Eric Cartman of the animated show *South Park*.

Yes, it's true. Actually, not Cartman himself but his co-creator, Trey Parker. I, like millions of wise Americans, am a devoted fan of *South Park*. So in the fall of 2011, when Comedy Central ran an excellent half-hour documentary about the making of the show, titled *Six Days to Air*, I tuned in.

In the middle of the show there was a scene that changed my life. It was extraordinarily profound, and I believe it can transform the entire world of science. The scene featured Trey Parker talking about his technique for editing the first draft of each show's script. He said,

> I sort of always call it the rule of replacing *and*'s with either *but*'s or *therefore*. And so it's always like, this happens, and then this happens, and then this happens—whenever I can go back in the writing and change that to this happens, THEREFORE this happens, BUT this happens—whenever you can exchange your *and*'s with *but*'s or *therefore*'s, it makes for better writing.

His words hit me like a bolt of lightning. So clear. So clean. I had never heard such a simple rule for storytelling. I wrote it down immediately. I've now spent three years researching it, going all the way back to Aristotle (Trey Parker didn't invent the idea). I've given a TEDMED talk on it, published a letter in *Science* about it, and used it nonstop in my workshops.

I've developed it into a simple one-sentence, fill-in-the-blanks template called the ABT (meaning "And, But, Therefore"). The template is this:

_____ and _____, but _____, therefore _____.

Every story can be reduced to this single structure. I can tell you the story of a little girl living on a farm in Kansas AND her life is boring, BUT one day a tornado sweeps her away to the land of Oz, THEREFORE she must undertake a journey to find her way home. That is the ABT at work.

In a more practical way, a scientist could say, for example, "I can tell you that in my laboratory we study physiology AND biochemistry, BUT in recent years we've realized the important questions are at the molecular level, THEREFORE we are now investigating the following molecular questions . . ." That would be the narrative of that particular research program. You can do the same for whatever you are working on.

The ABT is also a tool for creating an "elevator pitch" (a concise explanation of a project) in a way that draws on the power of narrative structure. We will get into this in great detail in part 3.

The Hegelian Way

"The ABT is the DNA of story." That is what Park Howell, a professor who teaches storytelling in the business school at Arizona State University wrote to me recently. I believe this is correct and is not an exaggeration. The ABT really is that powerful and profound.

But then guess what I discovered as soon as I started talking in terms of DNA. Two other authors think they've discovered the DNA of a similar skill—argumentation—in the form of their own template.

In the enormously popular textbook *They Say, I Say* (it has sold over a million copies since publication in 2006), Gerald Graff and Cathy Birkenstein help you find the structure of your argument using templates. They start with the simple idea of presenting what your opponents say first, then what you have to say, before reconciling the two.

At the start of their book they say, "The central rhetorical move that we focus on in this book is the 'they say/I say' template that represents the deep, underlying structure, the internal DNA as it were, of all effective argumentation."

There you have it—two skills—storytelling and argumentation. Traditionally they have been seen as polar opposites—one has fun with the truth, the other tries to find the truth. And yet, there is a similarity of structure.

Look at the two templates—the ABT and "they say, I say." See any similarities? Both begin with the setup (a few facts in the ABT, what others say for argumentation), then establish a problem (using "but" in the ABT, telling what *I* have to say for argumentation), then the resolution of the two parts.

It's no coincidence that the templates are so similar. They are derived from what is really the true DNA of just about all interesting thought. It's called the Hegelian Triad or the Hegelian Dialectic. It was first identified by Georg Hegel, the great philosopher of the late 1700s and early 1800s. It has three parts—thesis, antithesis,

synthesis—just like these templates. It underpins pretty much everything from logic to reasoning to argumentation to storytelling. And guess what it also underpins—the scientific method.

So there's your real DNA. The Hegelian Triad is so powerful and universal that I've broken this book into the same three elements. My concern is the need for more awareness of narrative in the science world. I begin the book with "Thesis," where I describe the state of the science world today with its deficient awareness of narrative despite the ubiquity of narrative within it. Then I present "Antithesis," where I lay out a set of tools that could remedy this problem yet are not widely in use. Finally I pull it all together with "Synthesis," where I tell of the effectiveness of the tools and offer up my prescription of Story Circles as a means of propagating this knowledge.

I've also used another element of structuring. The first and third sections (Thesis and Synthesis) follow the ABT Template. Together these give the book narrative structure at multiple levels—just like a fractal pattern, which repeats itself at all scales (more to come on this). In fact, I like to say that the three letters should also stand for "Always Be Telling stories." We'll get much deeper into that, but let me now say the same thing in a different, perhaps more shocking, way . . .

Science Needs to Emulate Trey Parker

Now you're thinking I've totally lost my mind. I'm recommending the entire science world become more like Trey Parker. How in the world can I be saying this? Have my years of living and working in Hollywood made me into one of the lunatics in the asylum? Possibly. But first, hear me out.

In *Don't Be Such a Scientist* I looked at knowledge in terms of the cerebral versus the visceral. Academia with all its information is the place for the cerebral, while Hollywood—the land of emo-

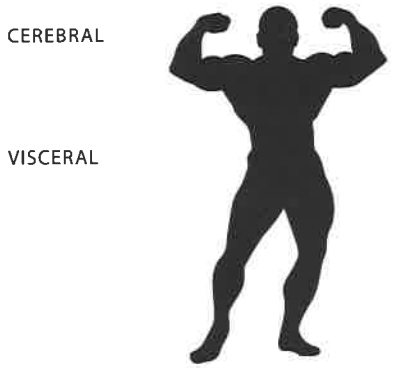

Figure 3. Cerebral versus visceral. Academia is the master of the cerebral, but Hollywood wins when it comes to the visceral. For success with narrative, you need both.

tion—is more about the visceral. College professors are masters of the cerebral but not that great when it comes to the visceral. Hollywood is the opposite—populated by plenty of bean brains but owning the visceral end of the spectrum, able to arouse the masses like no other force.

So let's look at Trey Parker. When it comes to storytelling, he is a 500-pound visceral gorilla. He has no graduate degrees. He's no scholar (and I'm sure he would be the first to admit this). He got his undergraduate degree at the University of Colorado then moved to the "storytelling gym" (Hollywood) and began lifting storytelling weights nonstop, day in and day out.

He put the burn on his storytelling biceps, starting in 1997, by telling stories, week after week, which *had* to work. He wasn't given the basic academic luxury of living a life of three options (yes, no or later). He and Matt Stone were put into the pressure cooker of storytelling with their animated series *South Park*—either figure out how to tell stories that work, or fail and go home. Do or die.

By 2011, when they shot the Comedy Central documentary, Parker had become narratively muscle-bound. *South Park* was by then the greatest hit in the history of Comedy Central, and Parker and Stone's musical, *The Book of Mormon*, had taken Broadway by

storm, winning nine Tony Awards. Parker's brain had become buff with narrative muscle. With that strength he was able to distill much of the whole story development process down to his simple rule of replacing *and*'s with *but*'s and *therefore*'s (which, as I will explain later, he picked up in college and which probably originated with one of the greatest screenwriting instructors of all time).

The Goals: Narrative Intuition and Narrative Culture

Trey Parker and many of my USC film school classmates possess what scientists need—narrative intuition. Narrative intuition is the ability not just to know the basic rules of narrative but to have absorbed and assimilated them so thoroughly you can actually sense them. In essence, to be like Trey Parker.

I have seen narrative intuition in action over the years with veteran screenwriters. They have two abilities. First, they can create stories that are concise and compelling, and second, they can listen to stories that are *not* concise and compelling and quickly figure out how to fix them. They have an ability to hear a story and immediately pinpoint why the story is boring or confusing.

If scientists had this trait at a deep level, it would enable them to fix or avoid many if not most of the problems I identified earlier. They would be more sensitized to the dark sides of storytelling. They would be less inclined to unknowingly make the mistake of false positives. If they understood and prioritized narrative, they would reduce the publication bias against null results. And if they had an intuitive feel for narrative, they would write and speak in a manner that was less boring, and not as frequently confusing. It is the change that is needed for the entire profession. No, narrative intuition is not a panacea (always, the science-minded will set to work picking holes in any proposition by taking it to the extreme), but it is a means of addressing a source of many problems.

Narrative is incredibly powerful, not just as a tool for the workplace but for making sense of the world. My purpose for writing this book is to urge scientists to put narrative on the score sheet. It should be one, if not the highest, priority for all science programs and agendas.

Achieving this intuition in a profession that is so steeped in narrative is the only long-term hope for combatting the problems facing scientific research and science communication. Instruction in narrative dynamics needs to happen at all levels, and especially at the very beginning of science education, so that recognizing and creating narrative can become intuitive.

If multiple individuals within an organization achieve narrative intuition, a "narrative culture" can develop. This culture can establish expectations and standards for a minimum level of narrative quality. Norms can change when everyone is expected to have a certain level of familiarity and competence with narrative dynamics. Once this happens, the secondary effect of "entrainment"—where people are swept along with the flow—can occur, making the new norms self-perpetuating.

This is not an unrealistic hope. The necessary tools are in this book. It's just a matter of embarking on the mission to make it happen, so let's get going.

The journey starts now.