DON'T BE *SUCH* A SCIENTIST

TALKING SUBSTANCE IN AN AGE OF STYLE

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by
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Island Press
Washington | Covelo | London

Library of Congress Cataloging-in-Publication Data

Olson, Randy, 1955–
Don't be such a scientist: talking substance in an age of style / by Randy Olson.
p. cm.
Includes bibliographical references and index.
ISBN-13: 978-1-59726-563-8 (pbk.: alk. paper)
ISBN-10: 1-59726-563-2 (pbk : alk. paper) 1. Communication in science. 2. Science in motion pictures. I. Title.
Q223.O47 2009
501.4—dc22

2009007081

Printed on recycled, acid-free paper 

Manufactured in the United States of America
10 9 8 7 6 5 4 3 2 1

Keywords: Public speaking, public relations, messaging, anti-science movement, academia, film, documentary, Hollywood, conservation, evolution, Flock of Dodos, Carl Sagan, science and entertainment exchange

THREE

Don't Be Such a Poor Storyteller

I want to share with you the single most humiliating public experience of my life. In the spring of 1990, Spike Lee's movie Do the Right Thing *was hitting America, I was a professor at the University of New Hampshire, and suddenly Spike was on campus for a simple event called "Open Mike with Spike." More than a thousand students packed a huge room in the student union just to ask him questions from two standing microphones. I decided to take a shot. I had just made my first foray to Hollywood with a screenplay, so I began telling him about my trip, my meeting at Columbia Pictures studios, what the executives I met with said, and a whole lot of other things—but something strange started happening about* five minutes *into my comment/question. I began hearing this reverberating, echoing sound that was bouncing around the massive auditorium. I couldn't quite make it out at first except I realized it was voices—a lot of voices—student voices—hundreds of them—a chorus—and then I finally paused my speech for a moment and heard what they were chanting. "Get to the point, get to the point, get to the point!" A wave of terror swept over me. I looked back at Spike and finished my speech by quickly blurting out, "So, like, what's up with that?" Then I put my tail between my legs and walked, head down, to the back of the hall. It turned out the event was being broadcast live on the student radio station. The next day a student stopped me in the hallway of the biology department and said, "Professor Olson, was that you last night asking that half-hour question?"*

You Bore Me

I used to have a German girlfriend. She was very funny—she came from Bavaria, where they love to laugh. I also used to be invited to go on trips with Harvard University alumni as a "guest naturalist," meaning I would help explain what the old folks were seeing in nature during trips to Norway, Antarctica, Australia, and Central America. I took this girlfriend with me on several trips. She would listen to me talk and talk and talk to the old folks, and finally, by the end of each day, she would have had enough. So her favorite thing to do in the evenings was, when I was done

talking, to look deeply, romantically, lovingly into my eyes and say in a soft and seductive Germanic voice . . . “You bore me.”

Which was true. I bore myself sometimes. I learned the art of boredom from my father. He was a military historian, and we were his pupils—my two brothers, two sisters, and I—at the dinner table. He served in Vietnam as a troop advisor in the early 1960s, and he felt a deep need for us all to understand the depth and complexity of the Vietnam problem. But the lectures on Vietnam weren't just about what was going on there at the moment. Oh, no. That would have been too simple and relevant. No, his lectures had to begin at the beginning, back before the American involvement, before the French involvement, back . . . oh, I don't know, maybe in the Paleozoic era or something. He would drone on and on for hours, not telling a story, just ambling about, relaying a stream of consciousness made up of all the disconnected factoids and tidbits floating around in his head. And we were like that “get to the point” audience. (How in the world could I have ever made the same mistake in public? Had to be a genetic element at work.)

Here's a big surprise: I grew up to be a scientist. And, guess what . . .

Scientists Are Poor Storytellers

Do you really need proof of this? If you do, go visit a research laboratory, walk into any lab, and ask the guy with the thickest glasses, “So what are you studying here?” Then take a seat, put your elbow on the table, chin in palm, and settle in for a half-hour ramble. How do I know this? Because I was one of those guys when I was a postdoctoral fellow at the Australian Institute of Marine Science. Tourists would ask about my automated underwater starfish larvae growth chambers and I would unleash a long-winded discourse that I felt wasn't finished until I had put out the fires of their curiosity. “D'ya wanna know more?” I'd proudly ask their backsides as they fled out the door.

It's a problem. Another girlfriend developed an affectionate nickname

for me, “Chief Longwind,” which she would abbreviate when I'd get going on something and just say, “That's enough for tonight, Chief.”

If you take a look back at those wonderful Stephen Jay Gould essays in *Natural History* magazine, what you'll see, as I mentioned, is a clear partitioning of the opening few paragraphs, providing the arousal, and then the following few pages, giving the fulfillment. This worked to a point, but the truth is that some of the opening hooks did make one wonder, “What exactly is this going to have to do with science?” Then, especially in his later years, he slipped into overstaying his welcome in the fulfillment parts. Some essays had page after page of minutia about taxonomists and natural history. He lost even me. The arousal bit can take you only so far with the reader.

So the arouse-and-fulfill strategy has its limitations. For all you scientists out there, it's kind of like the surface area to volume function in limiting organism size—you eventually reach a point where there's not enough surface area for gas exchange and the organism can't get any larger. At that point, the organism has to have a circulatory system. In other words, there has to be a different way of doing things. For communication, that different way, beyond the simple arouse-and-fulfill model, is storytelling.

It is an enormously powerful means of communication. With good storytelling you end up both arousing and fulfilling at the same time, which allows you to sustain interest over much larger amounts of material.

Storytelling is equal parts art and science. And there we have it already. Like all these other things we've been discussing, it's made up of two parts. One is more objective, the other more subjective.

The first part, story structure (or just story), is the objective part of telling a story. There is a science to story structure. It is something that can be taught and analyzed. The major studios in Hollywood have story departments, with story editors and story analysts. At film schools there

are countless courses in story writing in which the fundamental components of telling a story are taught.

Most screenplays, for starters, have an incredibly formulaic structure that is nailed down almost to the page. A standard screenplay is about 120 pages and has three acts that, in round numbers, are about 30, 60, and 30 pages in length, and each page roughly equals a minute of screen time. Within these three acts there are a number of points of structure, such as the "first plot point," which by convention generally occurs somewhere between pages 23 and 28. This is the point where the calm and quiet world of the opening act is suddenly overturned by the major "inciting incident"—the kidnapping, the murder, the declaration of war. Then there is a "midpoint" somewhere around the midpoint of the script (big surprise) . . . On and on, lots and lots of structure, which allows script analysts to determine if the formulas are being followed and, if not, to bring in a "script doctor" to fix things.

Story structure brings with it a great deal of seemingly objective rules and conformity—the sorts of things that make scientists very happy and content.

But there's a second element called character, and guess what? It's much, much more subjective. Where story is toward the science end of the spectrum, character is more toward the art end. Character is the way the actors talk and dress and walk and pose and laugh and all those things that end up being what people imitate years later when they talk about their favorite movies.

One of my favorite quotes from film school is from an interview we read with Rex Ingram, director of the classic 1921 silent movie *The Four Horsemen of the Apocalypse*, in which he said, "Nine times out of ten it's character that people remember from their favorite movies rather than story." And that's pretty darn true.

Think of your favorite movie. Maybe it's *Casablanca*? You remember Humphrey Bogart as Rick Blaine, the bitter, cynical American expatriate,

and all his famous lines about rounding up the usual suspects, beautiful friendships, and playing piano songs. What most people don't think of is the story point where Rick double-crosses Renault. You think of the characters that inhabit your favorite movies—Rocky, Rhett Butler, Dorothy Gale, Forrest Gump—not the story lines.

Character is so much more powerful and deep and complex, but it is also very elusive, hard to teach, hard to analyze. Sound familiar? It's the same divide as substance and style. And so you can imagine that if a scientist were to become a screenwriter, he or she would probably be naturally more drawn to story than to character—telling precisely crafted, intricate stories in which all the facts add up, but . . . the characters are dull.

But story is also incredibly important. And even though character is such a powerful and memorable part of it, it is through the properly structured story that the true magic emerges. From film school to the present I have been slowly and surely learning this, the hard way, through trial and error.

Entering film school at the University of Southern California, a lot of us thought we were great and gifted directors who very soon would be directing massive-budget movies, making them work like precision machines without even breaking a sweat. Three years later we were all pretty much wrecks, our self-confidence in shambles.

Film school will do that to you as you learn of the infinite complexities of film (remember all those elements I itemized earlier) and find out that telling a clear and simple story is a true art. The variety of elements alone allows enormous complexity. Then consider the sheer and total insanity of actors (just think of my insane acting teacher). You begin to realize that instead of running a precision machine, you're trying to drive an old jalopy with a loose steering wheel and mud all over the windshield. Directing a movie is not easy.

In our first semester we were taught a simple old adage, “If it ain't on

the page, it ain't on the stage," which means that if you haven't invested immense time and energy in the writing of a really good script, which gives everyone involved with the movie a clear picture of the finished product, you probably aren't going to end up with a very good movie.

I thought this was nonsense at first. I was a brilliantly talented filmmaker who had a crystal clear vision of the films I wanted to make. I didn't need to slave over some tedious script. I knew, deep in my heart, that I could take any script, no matter how ramshackle, dull, and pointless, and, with my actors and my camera positions, craft it into a masterpiece.

The only thing I didn't know was that I was really naïve. And would have to learn things the hard way. Through the school of hard poundings on the head.

When I finished film school I was forty-two years old—already practically retirement age in Hollywood—and despite the award-winning musical comedy I had directed in film school I was offered a big fat nothing when it came time to find work. (It was 1996, and I was told by every agent and manager I met that musicals were a thing of the 1950s, dead and over, never to been seen again, despite *Moulin Rouge!*, *Chicago*, *Evita*, and a stack of other hugely popular musicals that would emerge a few years later—ah, Hollywood.)

I wanted to direct comedy movies. In the end, the only opportunity to direct a feature comedy I could find involved a couple of young actors who wrote a not-so-great script, cast themselves as the leads, found a private investor, and hired me to direct it. I threw my massive ego into the project, determined to show I could turn any sow's ear into solid gold—and I failed. We ended up with a movie that, while fun, had not-so-great acting, didn't tell a good story, and had nobody wanting to buy and distribute it.

The whole process was deeply painful. It drove me down, by 1999, to the deepest, bleakest depths of Hollywood despair. All of the big agents

and managers who loved my musical (even though they told me the genre was dead, they appreciated what I had done), and who were still trying to think of ways to get me work, took one look at the movie and it was over. In an instant. That's what they do in Hollywood: you get your one shot. Those guys all shook their heads and basically said to themselves, “Ah, just like all the other schmucks. We knew he couldn't direct.”

It would take seven years for me to get over the trauma of that failed movie. But when I finally did, it occurred through a near religious experience in the making of *Flock of Dodos*, which brought me around to finally understanding, through much pain and suffering, why there is so much focus on storytelling in Hollywood.

It was the most powerful experience of my filmmaking career, and it reveals so much that I must now go through it in excruciating detail—though I'll try to get to the point fairly quickly so you don't start chanting at me.

Forging the Story of *Flock of Dodos*

The point of this section is that you have to have a story. There. I got to the point. Are you happy now?

As I mentioned earlier, in 2005 I read an article in the *New Yorker* titled “Devolution: Why Intelligent Design Isn't” by H. Allen Orr, which prompted me almost instantaneously to start filming *Flock of Dodos*. Yielding to my improv and Meisner training, I quickly assembled a crew, flew to Kansas, and spent a week filming interviews. Then we went to the East Coast for another week of interviews, and before I knew it I was sitting in our editing suite in Los Angeles showing these interviews to friends and listening to their enthusiastic responses.

What they all said was the same thing, over and over: “This is incredible raw material. Now if you can just put it together into a story, you'll have a good film.”

Yeah. Very simple. Like standing in your living room looking down at the floor, where hundreds of unassembled pieces of a gargantuan Ikea combination desk/dresser/chopping table are laid out, but you have no instructions or picture of the finished product. Just a bunch of friends admiring the beauty of the unassembled pieces and saying, “We know you can do it—we can sense you've got something great here.”

And the extension of that is, “However, if you fail to put these pieces together in a way that works, we're going to write you off as a total loser and make you feel guilty for having taken up the time of the good people you interviewed.”

The pressure began to build as we started editing. And now I want to tell you how this film came together on a weekly basis so you can, I hope, appreciate the magic and power of storytelling as I did.

In the first week of editing I created what is called an “assembly cut,” which means I took all the interesting pieces of interviews and interesting scenery and spliced them together into about a three-and-a-half-hour cut, which I showed to only one person, my good friend and trusted longtime producer, Ty Carlisle. He said, “Okay, nice start. You've clearly got the goods; now get to work crafting a story.”

It was like a giant piece of marble, ready to be sculpted into the Venus de Milo. But for now it was just a giant, shapeless lump.

The next week I started putting together sequences. I made up a bunch of rules for myself, like “The story needs to start with the quirky little tidbit about my mother being neighbors with the big lawyer for intelligent design in Kansas, John Calvert,” and “It needs to work its way to the grand synthesis of what evolution is and why it's so important to teach,” and others that I made up as I went along.

That Friday I called together the six or seven folks working with me—my sound editor, animator, producer, cameraman, and so on, for a viewing in our office. This cut was about two and a half hours. When it ended and I turned up the lights, everyone seemed exhausted and had

pages and pages of notes. We began talking about the movie, and though everyone echoed what Ty had said the week before—that the raw materials were there—nobody was smiling.

They began going through their notes, and disagreements broke out. One person said, "You need to open with the Dover trial, since that's what's in the news right now," and another said, "No, you need to finish with the Dover trial; it brings us up to date with current events." On and on, for an hour of nearly complete disagreement. Everyone's suggestions were huge in scope—like "Move this entire section to the front"—and nobody felt particularly confident in their suggestions.

"Finding the story" for "Flock of Dodos"

Week 1	Assembly Cut (3.5 hours)	Academics
Week 2	Calvert/Muffy Moose, Disc. Inst., Dover, I.D., Kansas, Evolution	Teachers
Week 3	Disc. Inst., Evolution, Kansas, Muffy Moose/Calvert, Dover	Teachers
Week 4	Dover., I.D., Disc. Inst., Evolution Kansas, Muffy Moose, Calvert	Teachers
Week 5	PROLOGUE	Muffy Moose
	ACT I	Evolution & Intelligent Design Journey: Off to Kansas
	ACT II	Kansas in search of Calvert Confront the Dragon
	ACT III	The Real Dragon: Discovery Inst. Resolution: Information Wars

Figure 3-1. The "evolution" of the story line for the documentary feature *Flock of Dodos* during the first five weeks of editing.

I went to work on the next cut, this time opening with a description of the big, bad Discovery Institute, which led into the topic of intelligent design and then . . . on and on. That third week's version was down to about two hours, but when I flipped on the lights at the end of the viewing, the faces looked even grumpier and everyone still basically

disagreed.

Worst of all, I began to split off from the rest of the group. I began to say, “I'm actually liking this cut—it's starting to work pretty well for me,” while the others were saying, “It still doesn't tell a good story. Nobody other than professors will want to watch this.” Our disagreements were intensifying, and I was starting to take it personally—which led to the big blowout at the end of week four.

When the lights came up at the end of the week four viewing, the gloves came off. I had a smile on my face and said, “Looks like it's about there.” No one else was smiling. Everyone said, “Sorry, but it's just not a story. You've got a few good sequences here, but it doesn't add up, doesn't build toward anything. It's . . . boring.”

Of course, those are fighting words, which is precisely what happened. I ended up snapping at everyone, telling them they were blind, that it was a great movie and it was almost done. It *had* to be done because we were running out of money. But they all held their ground and withheld their praise (my friends are tough). And I erupted, shouting at them, telling them to get out of the editing suite, that they sucked and didn't know what they were talking about.

When they all left, I closed the door and sat in front of the computer, and the darkness began to settle in. I stared at the clips on the screen and began to realize we had $200,000 tied up in something that my crew was telling me would never make it out of classroom viewings. This couldn't happen. So I plunged headfirst into the abyss.

I called Ty and told him to take the next three days off. I went home and got a few days' changes of clothes and then came back and went to work. I did the standard movie-writing thing of filling out index cards for every scene and placing them all over the floor. And I began searching for “the structure” of a possible story.

I ordered food delivered. I slept on the couch. I cut and recut the scenes. And, slowly but surely, a very simple (and in retrospect obvious)

story began to emerge.

It was the story of a man who sets out on a journey to save a damsel in distress. He must protect her from the dragon that lives next door. But when he finally confronts the dragon, it turns out to be a teddy bear. He realizes the real threat is not the dragon but an evil empire, and in the third act he goes in search of it.

That ended up being the more or less “mythic” structure beneath the story I told for *Flock of Dodos*. I was the “man,” the “damsel” was my mother, her “homeland” was Kansas, the “dragon” was her neighbor, the lawyer for intelligent design, and the “evil empire” was the Discovery Institute in Seattle.

Somewhere around Wednesday night I finally hit on these revelations and pulled together the rough pieces, and Friday afternoon, when I unlocked the door and allowed everyone back inside to view what I had assembled . . . a miracle happened.

When I turned up the lights at the end of the viewing, there were smiles all around. People said, “That was fun,” and “That blew by in what seemed like about thirty minutes” (it was still nearly two hours), and, most important, “You've finally got a story.”

Their notes were now minuscule. Instead of suggestions for moving huge blocks of material from one section to another, the suggestions were things like “You should add a few more seconds of Dr. Steve Case and maybe make a graphic to illustrate what he's talking about,” “We need more of your mother,” and things of that sort.

Never again was there a major frown of frustration or boredom from viewers, whether during an editing screening or at a public event. The simple structured story has carried the film through hundreds of public screenings with all sizes of audience. Bring the lights down, tell everyone a simple story, and they will allow you to get away with all sorts of things. It is truly magic.

And that's how you get beyond the arouse-and-fulfill dictum. Keep the

story going and you can keep the flow of information going . . . forever. That's what a good television series is—an ongoing story, week after week, feeding you information about the characters and story.

But There's a Catch: You Have to Suspend Disbelief

So now we know how to convey information in a wonderfully enjoyable and painless way through the telling of a story. It would seem that if scientists were interested in communicating at all, they would use storytelling at every opportunity. But there's a catch.

For an audience to enjoy a story, they have to take part in an exercise of trust known as the "suspension of disbelief." The poet Samuel Taylor Coleridge, who wrote *The Rime of the Ancient Mariner*, coined the term in his *Biographia Literaria* when he referred to "that willing suspension of disbelief for the moment which constitutes poetic faith."

The audience has to be willing to believe the storyteller at every turn and not bog the process down by asking themselves, "Do I really believe this could happen?" If you have to ask yourself that, you can't enjoy the story. It's a fundamental rule of storytelling, and it's where scientists get left out of the picture because their job is to question *everything*.

This is what scientists do for a living: they are trained *not* to take the bait. When you give a scientist a paper to read, instead of being your typical rube and believing every word simply because it's in print, he or she will question the premise, question the assumption, demand to see data, demand that you cite your sources—scientists just aren't gonna go for a ride in a car until they've kicked the tires and looked under the hood. This is why the phrase "Scientists agree . . ." actually means something. But it comes at a price—actually, a couple of prices. The price of storytelling, here, and the price of "likeability," which I'll discuss in the next chapter.

The refusal of scientists to suspend disbelief occurred with my film

Sizzle: A Global Warming Comedy. The film is a "mockumentary," mixing the reality of my being a scientist-turned-filmmaker with the fictitious premise of my trying to make a documentary about global warming that runs into countless problems. The mix of genres ends up splitting the scientists out of the audience, as I explain in detail in appendix 1.

This is not to say that scientists can't enjoy plenty of stories. But still, I promise you, they simply do not enjoy them as much as the general public. They view themselves as the "designated drivers" of the storytelling audience. While everyone gets drunk on entertainment, the scientist maintains a certain level of sobriety, always keeping an eye on the facts.

I remember seeing scientist Carl Sagan on *The Tonight Show* with Johnny Carson in 1977, talking about the new science fiction movie called *Star Wars*. He agreed that the film was wonderfully fun, but he said he was still disappointed at tiny details they didn't have straight, like Han Solo using the term "parsec" as a unit of time when it's actually a unit of distance.

And, yes, now you're thinking, "Well, that happens for anyone—if I go see a film shot in my hometown, the Bronx, and there are snow-covered mountains in the distance (as there were in Jackie Chan's campy *Rumble in the Bronx*, shot in Vancouver), I'll have the same problem enjoying the film." Yes, but it's different for scientists because this mind-set is such a fundamental way of life in the profession of science—it is applied to *everything*.

Archplot, Miniplot, and Antiplot

It's worth taking a minute here to delve a tiny bit further into story structure and why it is such a fundamental part of communication. The telling of stories is how we come to understand our lives.

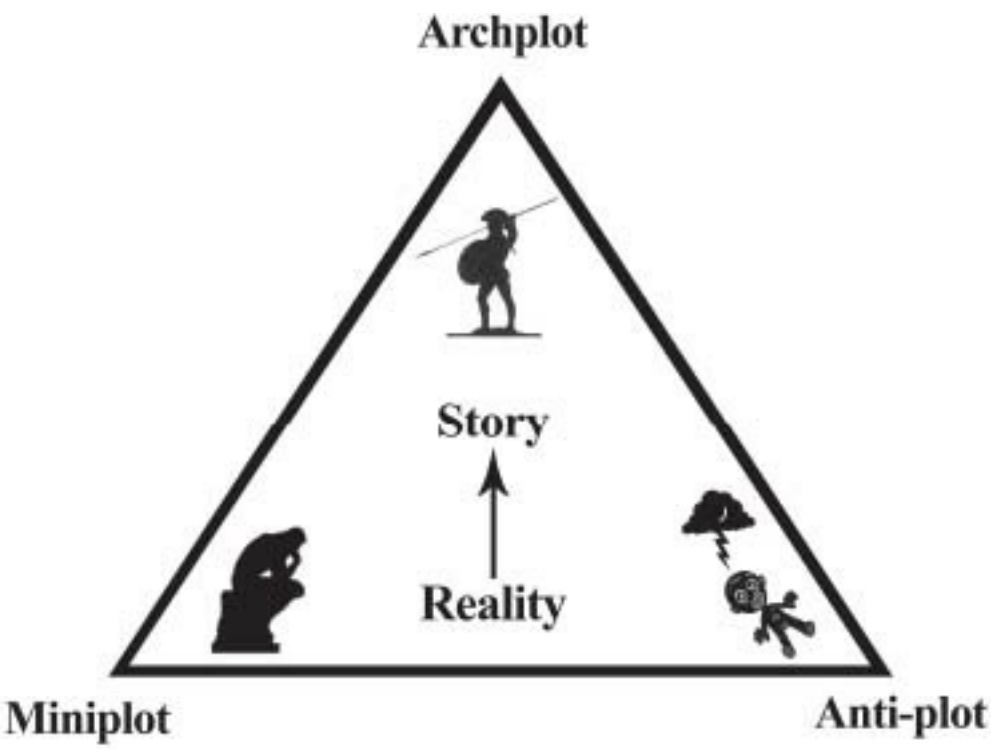

Figure 3-2. Triangle of story plots adapted from Robert McKee's *Story*.

One of the best books written about it is *Story*, by Robert McKee. McKee identifies three types of plot and describes their structure by using a triangle (see figure 3-2). At the top of the triangle is the classic blockbuster movie story line, which has mythic structure underlying it. He calls this "archplot" (pronounced arc-plot).

Archplot produces what McKee calls "classical design," meaning all the standard things we think of—a hero sets out on a journey to combat the forces of evil, is faced with challenges, has lots of ups and downs, and eventually succeeds, concluding the story with a happy ending. This structure includes everything from *Star Wars* to *Rambo*.

At the base of the triangle are two types of movies that don't do those things. Miniplot is pretty much the opposite of archplot—there might not be a single hero, the struggle might not be against bad guys but instead might be within the hero's head, there might be many enemies, and the story concludes with an ending that can be vague and unresolved—an "open" ending. These are smaller, more artsy movies, like *Tender Mercies* and *Paris, Texas*.

Antiplot is the other extreme, where plot is simply thrown out the

window—no interest, care, or concern for telling a story. Events jump around randomly, things happen for no particular reason (including coincidence), and not much adds up logically. This includes crazy movies like *Monty Python and the Holy Grail* and experimental films like *Meshes of the Afternoon*.

So much of our daily lives consists of having real-world experiences that are somewhere near the base of the triangle—a long way from archplot, and maybe even in the realm of antiplot—just a bunch of random events. But the way we make sense of events is by editing, trimming, rearranging, and massaging the information in an effort to slowly move it toward archplot. We try to make it into one of the simple stories we best know how to understand and relate to. We try to simplify things into a single good guy and a single bad guy with a single clear conflict that leads to a climax and then a resolution. We can't always make this happen, but when it does, it's very satisfying. And very accessible to the general public.

This is what I did with *Flock of Dodos*. I made the whole complicated issue into a simple story of one "hero" (myself) setting out on a journey to confront one "bad guy" (my mother's neighbor). And, as I said, as soon as I rearranged all our material to tell that story, it instantly became watchable.

The molding of the real world into story structure takes place every day. I think the first time I became aware of it was in my freshman year of college at the University of Kansas, when I was living in the Sigma Nu fraternity house. Night after night we would "go out drinking" at the bars, moderately interesting things would happen, and then, the next morning, as all the guys would awaken with hangovers, the stories would be told. And lo and behold, an evening's worth of random events would, in the minds of the better storytellers, emerge as something much closer to archplot—for example, one of our guys at the bar "who was just minding his own business" (the hero of our story) had a beer splashed on him by a jerk (the antagonist), who then called him a name (crisis), and onward as

a not-that-simple evening is reworked into a simple, fun story that everyone can follow. The fact that our hero was also a jerk and was hardly splashed with the beer and didn't really feel that challenged—those are all details that got left out in the interest of telling a better story.

The key point is the fundamental movement from miniplot or antiplot to archplot as a means of reaching a broader audience. And now it is time for all of us who are scientists to brace ourselves and come to realize that we are no better than the rest of the human race when it comes to communicating our science, because . . .

Scientists Are F****s?

Okay. Sorry about that heading (the word is "frauds"), but I didn't come up with it. It comes from a Nobel laureate who, judging from his writings, was a very cool fellow. If you take a look at the world of science today and compare it with science in the 1950s, you see that the entire profession has slowly been becoming more "humanized" and less of the tortured, self-denying bunch of objectivists of the sort that Ayn Rand would have advocated. Scientists are more openly human today, and this fellow was a keen observer of the changes early on.

His name was Sir Peter Brian (or P. B.) Medawar. He won the Nobel for his work in physiology revealing the role of the immune system in tissue transplants. He died in 1987 after being awarded virtually every major honor possible in the world of science. He was, of course, a prolific writer of scientific works, but he also had a great many other interests in life, including opera, cricket, the philosophy of science, and the role of science in society in general.

As part of that last interest, he wrote a very interesting short article in 1963 titled "Is the Scientific Paper a Fraud?" He answered his question with a resounding *yes*:"The scientific paper is a fraud in the sense that it does give a totally misleading narrative of the processes of thought that

go into the making of scientific discoveries."

Specifically, he took issue with the way the standard scientific paper is written—and, guess what, remember how I told you how clearly structured a screenplay is for a movie? Well, it's the same deal for a scientific paper—the same three acts. Most scientific papers are written according to a *very* strict template that consists of four sections: introduction, methods, results, discussion. But those sections are the same as the three-act structure.

Act One—the introduction, in which the current state of knowledge is laid out, at the end of which, ideally, the knowledge is brought together into a specific question that needs to be investigated (the equivalent to the "inciting incident" in screenplays) and a hypothesis is proposed.

Act Two—"things happen" as methods are described and then the results of the experiment are reported in a completely impersonal way. "Just the facts, Ma'am" is the basic tenet of the second act.

Act Three—the more human element is brought in as the facts collected (the graphs and tables of data) are analyzed and the so-called hypothetico-deductive method is applied to make sense of what just happened and synthesize it into the grand scheme.

In the same way that the movie's lead character pulls it all together at the end of the story—whether it's Rambo laying out his philosophy of life or Bill Murray as John Winger in *Stripes* summarizing his patriotic sentiments—both the third act of a movie and the discussion section of a scientific paper are the place for the grand synthesis. It's basic storytelling dynamics.

What Medawar complained about was the charade the science world has engaged in over the ages in pretending that science is conducted with robotic processes that are not contaminated by the irrationalities of human thought and bias. The inherent philosophy of a scientific paper is the assumption that science is conducted through the process of deduction—that the scientist blindly goes about gathering information on all

aspects of a subject and then eventually sits down and, through the process of deduction, puts the information together to create a picture of what's going on.

The truth is, scientists are humans, and from the outset they rely on "induction," which draws on the highly human faculty of . . . intuition. What this means is that a scientist doesn't sit down and come up with twenty-five hypotheses to explain, perhaps, why only the top branches of a given tree species bear fruit. The scientist realizes from the outset that most of the possible hypotheses simply are not likely (the hypothesis that trees learn this behavior from their parents—not an idea really worth testing, you know) and quickly narrows them down to just a few reasonable ideas.

And this is where Medawar says the scientific paper is a fraud. The scientist tells himself that he is writing up "just the facts," but there have been a huge number of biases from the beginning of the project's conception. Which is why Medawar suggests that, instead of saving all the subjective elements for the discussion at the end of the scientific paper, the scientist should open the paper with them:

> The discussion which in the traditional scientific paper goes last should surely come at the beginning. The scientific facts and scientific acts should follow the discussion, and scientists should not be ashamed to admit, as many of them are apparently ashamed to admit, that hypotheses appear in their minds along uncharted by-ways of thought; that they are imaginative and inspirational in character; that they are indeed adventures of the mind. What, after all, is the good of scientists reproaching others for their neglect of, or indifference to, the scientific style of thinking they set such great store by, if their own writings show that they themselves have no clear understanding of it?

It's an interesting dilemma scientists face. They have to strive for objectivity and removal of bias—science loses its meaning if it turns into nothing but unsubstantiated opinions. Yet scientists, and the public in general, have to be reminded over and over again that science is conducted by human beings, not machines.

This was what made Stephen Jay Gould's writings and speeches so great. He was constantly pointing out that you can't understand the work

of previous scientists without understanding the person and the time in which they lived. All science is conducted by mere mortals.

Scientific Writing Is Still for Robots

Now let me twist this theme a bit with my personal realization that there are benefits to scientists' robotic tendencies.

In late 2006, after I had conducted a dozen or so successful public screenings of *Flock of Dodos*, I wrote up a cutesy two-page list of suggestions on how to stage a screening. I filled it with my usual corny attempts to be fun and folksy and sent it to Steven Miller, my scientist friend who was the executive producer of the movie. I expected a simple "Looks great" reply from him. Instead, what came back the next day was my document, covered in the red corrective ink available in the editing mode of Microsoft Word. He had slashed, burned, rewritten, and restructured the entire essay, removing all my personal tidbits of folksiness, rewording it in a more cold, clinical, professional voice—the voice of the science world.

My blood pressure skyrocketed as I looked over what he had done, and then I erupted with a bitter and angry "How dare you!" e-mail to him. But as I calmed down over the next few days, something began to sink in. Back when I was a scientist—particularly when I was a graduate student—we learned to write first drafts of our scientific papers, give them to colleagues, and then eagerly await their comments. The more red ink on the manuscript when it came back, the better. The only thing that would ever cause anger would be someone *not* covering the manuscript in red ink, suggesting they were just lazy. You never wanted to hear a short "It's great" reply, other than from your parents.

And so, when I got to film school, as we began writing scripts my first instinct was to ask my classmates to read my scripts and comment on them. But I noticed something immediately: almost no one else did this. The other students were terrified to have other people read their material.

And, guess what, after a while, I developed the same fear. What was going on?

Well, my big realization is that one of the great benefits of having everyone write like robots in the world of science is that you end up being able to evaluate each other's work like robots as well. Because the scientific paper has so little of the human element (it's created only from the head—no heart, no gut, and *definitely* no sex), when you read it you don't feel very much. And when you write your comments on it, you don't feel very much. And when the writer reads your comments, that person doesn't feel very much, either, except gratitude for your taking the time, or disappointment if you don't have much to say.

In harsh and severe contrast, creative writing is exactly the opposite. For creative writing to be good—for it to reach inside people as it's supposed to do—the writer has to infuse every sentence with the energy, vitality, and life of the writer's personality. Creative writing draws on all four of the organs, in a big way. As a result, the entire process is massively personal. It has to be. People tell you, "Don't take it personally," but that doesn't work for art. If you're creating true art, you have to take it *all* personally because it's your personality you're seeding the work with.

This explains my horrible reaction to Steven Miller's comments on my quirky little essay on conducting screenings. He, still being a scientist, thought nothing of giving it a major rewrite. And, had it been fifteen years earlier and the essay a draft of a scientific paper, I would have thanked him sincerely. But instead, it was about art. And I reacted like a diva.

"Reality Ends Here"

Now let's go back to the power of storytelling. The USC School of Cinematic Arts is made up of two main buildings with a walkway connecting them (or at least it was—USC just opened up a gargantuan

new set of cinema buildings). Scratched into the cement of that walkway, from long ago, is the motto of the film school—"Reality Ends Here."

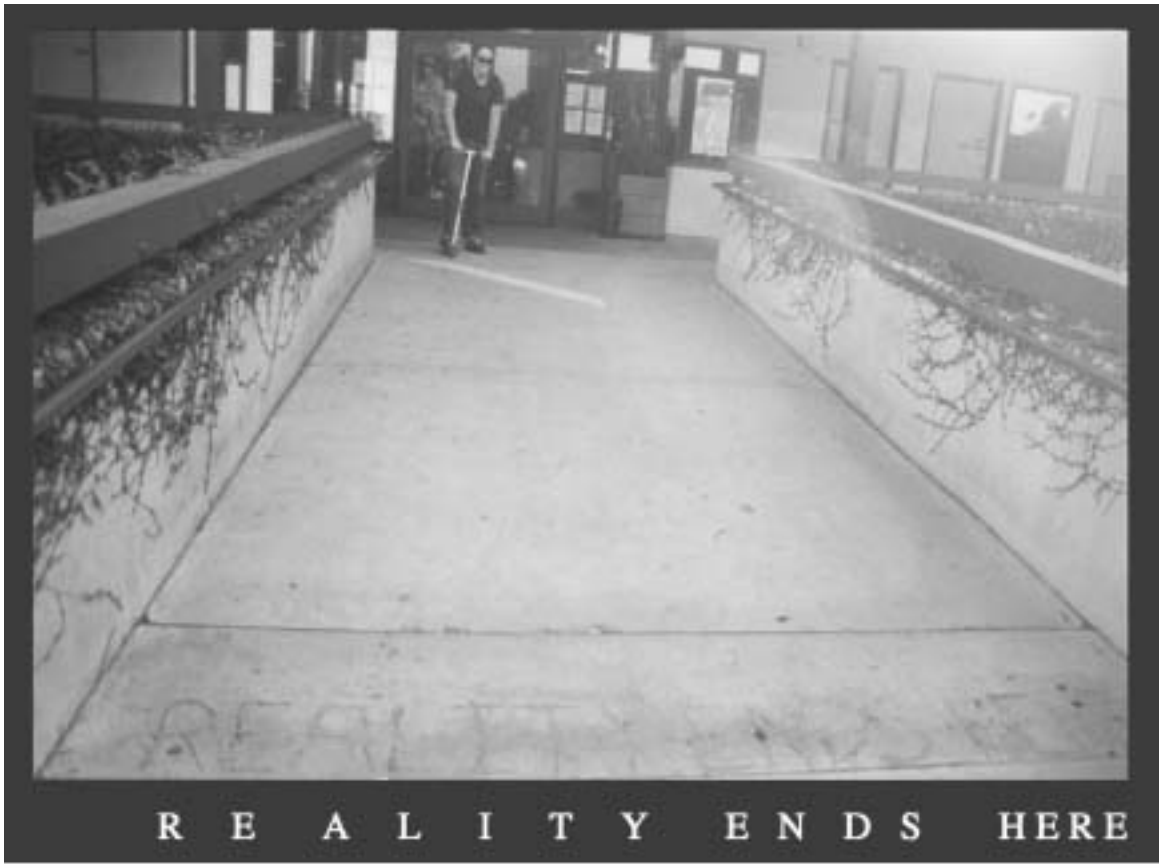

Figure 3-3. The motto of the USC School of Cinematic Arts, scratched into the walkway between the main buildings. Photo by E. Schmotkin.

I saw it the first day I arrived at the school, in January 1994, and had a light chuckle. It would take me a few months to begin to grasp how powerfully true the little slogan was.

I brought to film school what I thought was the creative equivalent of gold. I had fifteen years' worth of amazing stories from the world of marine biology: typhoons, shark attacks, sinking ships, modern-day pirates—a treasure trove of stories. I had spent a month in Antarctica, not just diving under twelve feet of ice into the clearest water on earth but also spending night after night in the dining hall listening to military helicopter pilots tell about crashing into icebergs, rescuing survivors of ice-crushed ships, and hovering over enormous pods of humpback whales. And I had spent a week in an undersea habitat, living at a sixty-foot depth and listening to the tales of the support divers, who had

worked on oil rigs, battling sharks and watching drowned divers' skin turn to foam as they rapidly ascended from extreme depths. I had heard about divers dragged down by weights into black, watery graves.

My mind was overflowing with these stories, and I went to film school to turn them into amazing movies. But there was one catch I hadn't been warned about. It was scratched in that walkway—"Reality ends here," or, in blunter terms, "We don't give a shit about what really happened."

It didn't take long for me to end up in a writers' group, telling about the novel I had written that was set in Antarctica, cobbled out of all the real things I had seen and heard about there. And when I finished telling the story to the group, I looked up and saw expressions of disappointment.

"Could you have the scientists at the one research base have a bunch of automatic weapons that they smuggled down there, which they use to attack the scientists at the neighboring base?" someone asked.

I listened for a moment and thought about what a stupid suggestion it was. "Well, no," I replied, "that would never happen."

"Why not? Why couldn't they mutiny at their base and go on a rampage?" the one guy said. And then another guy said, "Yeah, and it could be like *Lord of the Flies*—they're all isolated and have lost their minds."

Another guy chimed in, "And the genetic work they're doing has suddenly given them superpowers." On and on, as I sat there thinking, "My stories aren't good enough. Reality loses to fantasy when it comes to telling stories." And that's the bottom line. The harsh truth of it. Yes, the supposed reality of reality television shows is hugely entertaining, but those things are concocted. The actual, real reality of the real world—the ugly, non-archplotted details of the tedious day-to-day life of scientific research—really doesn't cut it for the broader audience.

Why did they want to add these elements? Because "it makes for a better story." Slowly but surely in these writers' groups and classes, I began to realize there is a partnership at work. Audiences have a set

number of stories that they like to hear and that they want storytellers to tell. If you can lock onto one of these set stories, all of a sudden everyone can really start to have fun.

That's what I was talking about with my crafting of the story for *Flock of Dodos*. When it was just my story—my telling of things the way they looked to me—the size of the audience was very limited. But when I began to rework the details into *their* story—into something that resembled one of those standard stories *they* like to hear (about the hero defending the damsel from the neighboring dragon)—I began to enter into the agreed-upon partnership that exists for storytelling.

It truly does work this way. One interesting guy I got to know in my early Hollywood adventures was Danny Sugerman, former manager of the 1960s rock band the Doors. He and Jerry Hopkins coauthored *No One Here Gets Out Alive*, the tremendous biography of Jim Morrison, lead singer of the Doors. They consciously set about taking the events of Morrison's life and making him into a myth—a character larger than life. They did a wonderful job of it, the book became a best seller, and the legend of Jim lives on. But Danny did have to contend with one big annoyance: the Doors' guitarist, Robby Krieger, regularly gave interviews in which he said that Morrison wasn't that big of a deal; he was just a human. Nobody wants to hear that.

Similarly, doctor-turned-science-fiction-novelist Michael Crichton describes in his autobiography, *Travels*, how when he was first becoming famous while still a resident at Harvard Medical School, his colleagues would ask breathlessly what it was like in Hollywood. If he told the truth and said it wasn't that big a deal, they were disappointed. They wanted big, grandiose stories. As he put it, “The blatant insincerity of the way I was treated troubled me very much. I didn't yet understand that people used celebrities as figures of fantasy; they didn't want to know who you really were, any more than kids at Disneyland want Mickey Mouse to pull off his rubber head and reveal that he's just a local teenager. The kids want to see Mickey. And the doctors in the cafeteria wanted to see Young

Dr. Hollywood. And that was what they saw." People like their big stories. It's a natural part of being human.

Accuracy versus Boredom: The Two Mistakes of Storytelling

So now we know that scientists can be very, very good at maintaining their sobriety and making sure that, whether or not they enjoy the story being told, they don't get so swept up in the magic that they allow the storyteller to make big mistakes. But is accuracy the only important challenge a storyteller faces?

The answer is, of course, no. A storyteller faces two big challenges: to keep it accurate *and* to keep it interesting. If either is not attended to, errors will result. We'll call these two errors "type one" and "type two," in part because I want to eventually draw a parallel with the world of statistics.

To a scientist, there is nothing worse than inaccuracy. The *American College Dictionary* defines science as "a branch of knowledge or study dealing with a body of facts or truths systematically arranged and showing the operation of general laws." The key part is "facts or truths." Science means nothing if it isn't grounded in the truth. This is why scientific fraud is held up as unforgivable. It seems people can commit plagiarism in other disciplines and get a slap on the wrist, but in science, to be caught fabricating data is to have lost all meaning to the profession and to be banished for the rest of time.

As a result, scientists watch movies about science with an eagle eye for every single detail. And the makers of films about science live in dreadful fear of hearing from scientists that they "didn't get it right." When you hear scientists complaining about Hollywood's portrayal of them, the complaints are always along the lines of "That's inaccurate—that's not what we really do or sound like." What you don't hear much

complaint about is the second fundamental error—mistakes of boredom.

What is boredom? It's the state of being bored. What is the state of being bored? It is to experience something that is dull, tedious, repetitious, uninteresting. So it's the opposite of interesting. And to “be interesting” is, according to the closest dictionary I can find . . . “to arouse a feeling of interest.”

There's that word again, “arouse.” It's about stimulation. Something that is interesting stimulates the neurons in the brain. Something that's boring doesn't. And when the brain is numbed into disinterest, communication doesn't take place.

So what's worse, to communicate inaccurately or not to communicate at all?

It's the dilemma that scientists and science communicators face every single day with every communication exercise they attempt. And that is because accuracy and interest do not always go easily hand in hand.

Let's get back to those two errors that I mentioned in terms of telling a story. They are similar in nature to the two main errors that statisticians worry about in their work.

When scientists need to make a decision (“On the average, is this species of tree bigger than that one?”), they bring in the statisticians. These are the folks who enable us to say confidently, on the basis of numbers, whether the decision is “Yes, this one is bigger” or “No, this one is not bigger.”

With any given decision like this, two fundamental errors can be made. The first error possible, known generally as a type one error, refers to the idea of making a “false positive.” In a legal case, it would be basically the risk of hanging an innocent man. In the case of scientifically describing nature, it would be the risk of saying you see something when in reality it isn't there.

The second error possible, obviously known as a type two error, refers

to the idea of making a “false negative.” In a legal case, it would be the risk of letting a guilty criminal go free. In the case of nature, it would be the risk of failing to see something that exists. For example, the two tree species really are different in size, but you don't have enough data to draw that conclusion, and thus you make the mistake of concluding that they are not different in size.

The most important thing to note for these two errors is that we don't live in a perfect world. Which means that it is rarely possible to do a good enough job that you can guarantee not making either mistake. To deal with this, we end up choosing one of them as being more important than the other. In the case of the legal system in the United States, we place highest priority on the type one error. We say that, all else equal, we're more concerned about punishing innocent people than we are about letting guilty people go free. And so we have a default rule that a suspect is innocent until proven guilty. A nation could just as easily have the opposite legal system—that those arrested are assumed guilty until they can prove otherwise. The key point is that you have to choose one. It's like in baseball, where “a tie goes to the runner.” It has to go one way or the other.

So here's where it gets interesting for communication. We see the same two types of errors for storytelling (errors of accuracy versus boredom). The choice must be made which of the two errors is most important. Yes, I know, you're thinking, “I want both—a story that's accurate *and* interesting.” That's ideal, but in the real world you still have to choose one, just as you do with the two errors in statistics.

And when the dust settles, it's clear that scientists, being detail oriented and believing that accuracy is sacrosanct, will always focus on errors of accuracy as their greatest concern. In the same way a physician lives by the credo of “First do no harm,” a scientist lives by “First, make no mistakes of accuracy.” And this is a great strategy for the ivory tower, where the rules for decision making are yes, no, and later. But, as the amount of information and the pace at which it is communicated increase

in our society, “later” is becoming less of an option for the science world. And that leads to a major, major, major quandary, which I shall now address through an extremely important case study.

Case Study: Two Global Warming Movies of 2006

Before I begin this discussion, I want to make my overall opinion clear concerning Al Gore's movie *An Inconvenient Truth*. It is, plainly and simply, the most important and best-made piece of environmental media in history. End of story.

You can talk about Rachel Carson's *Silent Spring* and how it gave birth to the entire environmental movement, but Al Gore's movie took the broadest and most urgent environmental issue and jumped it up from background noise to buzzword. There's no point talking about any shortcomings as if they mattered. You can expect only so much from a single piece of media. His movie went way beyond what anyone could have realistically expected. In the spring of 2006, when I was at the Tribeca Film Festival with *Flock of Dodos*, I heard skeptics in the independent film world laughing about Al's movie being “a PowerPoint talk—who's gonna want to buy a ticket to a movie theater to see that?” Most of them couldn't believe it when the movie scored over $50 million in worldwide box office. It was an unmitigated success that deserved to win both an Academy Award and a Nobel Prize, and, guess what, it did. Total success.

However. That said, it doesn't hurt for us to take a few minutes to compare it with another movie on the same subject that came out the same year from the same executive producer.

In April 2006, HBO aired a documentary about global warming titled *Too Hot Not to Handle*. It is a very solid, relatively impersonal and objective effort featuring interviews with a lot of top scientists. It aired on Earth Day and came out on DVD a few months later.

In May 2006, the feature documentary *An Inconvenient Truth* premiered. The movie is a personal narrative by former vice president and Democratic presidential nominee Al Gore about his lifelong connection to the topic of global warming, dating back to his undergraduate days. Interwoven with his PowerPoint presentation of the impending risks of global warming are personal insights, in which Gore reveals the pain of tragedies involving his sister and his son, as well as occasional humorous quips.

Here's where it gets interesting. In addition to their subject matter, these two movies have one large element in common—the executive producer, Laurie David, was a major mastermind of both movies. She's the former wife of comic writer and actor Larry David—cocreator of *Seinfeld* and star of the extremely funny HBO series *Curb Your Enthusiasm*.

Laurie David is herself a force of nature. She has been a board member and trustee of the Natural Resources Defense Council for years and has collected mountains of accolades for her relentless work on global warming. So it is fascinating to compare these two films, not just in terms of substance and style but also in terms of our two potential errors —accuracy and boredom.

The HBO film has tons of substance. It is packed full of scientists talking, and when experts of their caliber talk, they are incredibly accurate. They know their stuff. So it scores an A+ on substance, and you can be certain the accuracy is high. In terms of style, it was well shot and well produced, with plenty of beautiful images of nature to illustrate what the scientists are talking about. But when you consider the question of whether it's boring—well, it doesn't have a personality associated with it. It doesn't tell any sort of intriguing story. It mostly just disgorges the facts and details and lets them splat on the floor for everyone to pick among. Bottom line, it is pretty boring.

The Al Gore movie is sleek, cool, and as hip as the formerly dull vice president could possibly be packaged. It scores pretty close to an A for

style. And when it comes to substance, it has plenty. That's why it won an Oscar—it's rich in both substance and style.

Gore didn't shy away from wading into one graph after another, in a manner no one has ever had the courage to do when hoping to reach the general public through film. So it is a reasonably unboring movie (though I'm sure thousands of schoolkids who have been forced to watch it would disagree). But when it comes to accuracy . . . *that* is where it gets interesting.

The Al Gore film is not 100 percent accurate. Countless opponents of global warming science have made as much hay as they possibly could out of this. But both sides agree there are shortcomings in accuracy.

Perhaps the most reliable assessment comes from Danish biologist Kåre Fog on a Web page comparing the number of "flaws" and "errors" in the Gore movie with those in the books written by Bjørn Lomborg, one of the most prominent in the chorus of voices who are skeptical of environmentalism. It's a fairly balanced assessment that, if anything, is probably skewed in Gore's favor, since the site is so anti-Lomborg. But even Fog's analysis concludes that there are at least two "errors" (things that are factually incorrect) and twelve "flaws" (he defines a flaw as "a misleading statement which does not agree with the facts").

The *New York Times* gave an overview of the science community's assessment of Gore's film. Perhaps the most important opinion in the article is that of James Hansen, director of NASA's Goddard Institute for Space Studies and the leading critic of the George W. Bush administration's handling of global warming. The article says, "Hansen said, 'Al does an exceptionally good job of seeing the forest for the trees,' adding that Mr. Gore often did so 'better than scientists.' Still, Dr. Hansen said, the former vice president's work may hold 'imperfections' and 'technical flaws.'"

When those words come from such a powerful scientific source, who is desperately fighting the fight for global warming concern, you know

there genuinely are “errors of accuracy” in the movie.

And yet, when we look at a few simple indicators of the “success” of the two films, what do we see? As I write this, looking at Amazon's DVD sales, the HBO movie is ranked just over 35,000, while the Al Gore movie ranks 431. And when I look at their respective pages on the Internet Movie Database (www.IMDb.com), I see that the HBO movie lists just 2 external reviews, while the Al Gore movie has 357.

Guess which movie had the greater impact? Try asking your neighbors which title they recognize. One of the two reviews listed for the HBO movie actually compared the two movies, side by side, and had this to say, referring to Davis Guggenheim, director of the Al Gore movie:

Table 3-1. *Too Hot Not to Handle* versus *An Inconvenient Truth*

	Too Hot Not to Handle	*An Inconvenient Truth*
Amazon rank	35,000	431
IMDb external reviews	2	357

> While Guggenheim's film is split more evenly between biography and science, and *Too Hot Not To Handle* is more heavily weighted towards the facts and figures, it's not the most compelling presentation. It's the cinematic equivalent of brussel sprouts vs. chocolate: one is good for you and certainly something of which everyone should partake, but the other is definitely tastier and more appealing.

Now, here's the most important detail of all. I spoke with one of the scientists in the HBO movie. This scientist told me that when it came to that movie, Laurie David did a very conscientious job of getting everything right scientifically, at great cost in time, energy, and entertainment value (as the review above indicates).

But when it came time for the Al Gore movie, “she basically asked all the scientists to leave the room,” this scientist told me. She simply said that global warming is too important a topic to allow it to get bogged down in facts, details, minutiae, excessive attention to detail, and poor storytelling.

They went for it on the Al Gore movie. They made a film that scored over $50 million in box office worldwide, that was not totally accurate

yet is still endorsed by James Hansen and most every other major climate scientist, and, most important, that changed the world. What do you say to that?

The *New York Times*' final word on the subject:

"On balance, [Al Gore] did quite well—a credible and entertaining job on a difficult subject," Dr. Oppenheimer said. "For that, he deserves a lot of credit. If you rake him over the coals, you're going to find people who disagree. But in terms of the big picture, he got it right."

Figure 3-4. What did *Too Hot Not to Handle* and *An Inconvenient Truth* have in common? They had the same executive producer, Laurie David. *Too Hot Not to Handle* was accurate but not popular. *An Inconvenient Truth* was popular but not accurate. Guess which one was full of scientists.

You Choose: Accurate but Not Popular, or Popular but Not Accurate

I will never, ever endorse the idea of striving for anything less than 100 percent accuracy in the making of any film related to real issues in the world of science. My movie *Flock of Dodos* has no scientific "errors" in it. But it also has very little science content, particularly in comparison with something as bold as Al Gore's film.

Nevertheless, this is the fundamental dilemma facing the world of

science today. What are you going to do about this movie that turned out to be the most important piece of environmental media in history yet is not completely accurate?

The major scientists agree that the movie's errors are minor and do not change its overall message, which they feel is completely accurate. But still, if you wrote a scientific paper and it was revealed that your data points in a graph were fudged even just a little bit to make your graph appear more convincing, you could say “Bye-bye, tenured professorship.”

There's a fundamental disconnect here, and given the idealized, objectivist, rational-thinking values that true scientists cling to, I don't think they ever want to have to deal with this dilemma. But it's there, it's real, and it's as fundamental to the communication of science as the bonds that hold molecules together.

So the big question remains: What are you gonna do when you finally realize there is more than accuracy involved in the effective mass communication of science?

Go ahead, tawlk amongst yerselves on that one.

One More Handicap for Scientist Storytellers

Here's a quick story about coupons. Once upon a time, when I was in high school, my father sat down at the breakfast table, opened a new box of Wheaties cereal, and began pouring the contents in his bowl, but all that came out were paper coupons. He was late for work anyhow, so he got up, disgusted, threw the box on the table, muttered something about “stupid products,” and stormed out.

My mother and brother stared at the box for a moment and then closed in. There was no cereal in it. Something had gone wrong on the production line. The only thing it had was about 1,500 coupons. Each one was worth one point, and you had to collect 100 to win a free turkey. Thanks to some freak accident, we had enough for fifteen free turkeys! (I

swear to this; you can ask my mother or brother.)

We cashed some of them in at our local store, kept a few, and gave a few to friends and the rest to our church. My father never really quite got it. I don't think he ever made it past his anger about the absence of his cereal. But this tale bears relevance to science communication and storytelling.

My father was as mad at his box of Wheaties as a lot of today's scientists are at the attacks on science. And yet, just as my father stormed away from a potential opportunity, it is the same story when scientists try to shut down the attackers of science. They are missing a valuable communication opportunity—a chance to tell a good story.

The Heart of a Story Is the Source of Tension or Conflict

One of the simplest rules they drilled into our heads in film school is that "the heart of a good story is the source of tension or conflict." Read any standard book on screenwriting: this is what it will tell you. And this is the major source of problems for most boring movies—no significant source of tension or conflict.

Do you think those science "educational" films I got subjected to in junior high school told stories? Of course not. They were just facts, facts, facts. No conflict. Nothing at stake over how it will turn out. It was like watching paint dry. You're not worrying about whether it will dry—you pretty much know it will. There's just no story to hold your interest.

A good story begins at the end of the first act. That is where the tension is established. For the first part of a movie, we usually get to know some sort of place and people. Everyone's happy. Right about the point where you start to think, "Something had better happen or I'm changing the channel," something usually does happen—the monster comes to town, the husband cheats, the child is kidnapped. Basically, the audience members sit up in their seats and say, "Whoa, this looks like a good

story."

Here again is where overly literal-minded scientists go wrong. They look at the people attacking evolution or global warming science and they get furious, wanting to shut them down and prevent the public from hearing them. But all you have to do is look at the number of times the subject of evolution has appeared on the cover of *Time* and *Newsweek* magazines in the past five years. It was hardly ever on the cover during the previous decades, but suddenly the conflict brought about by the intelligent design movement turned the subject into a good story, making it of interest to a broader audience.

The attackers of science are a potential communication opportunity. They are a source of tension and conflict. They can actually be used to tell a more interesting story, one that can grab the interest of a much wider audience. Which is exactly why I've used them in both of my movies.

Concision and the Elevator Pitch

So, now that I've overstayed my welcome with this chapter, I will finish with a few words about keeping things short. In the excellent 1992 documentary *Manufacturing Consent: Noam Chomsky and the Media*, the legendary linguist and political activist Noam Chomsky complains about his battles with the medium of television, specifically the news talk shows that won't have him as a guest.

Over the years, Chomsky has learned about a criterion that television producers call "concision": the ability to speak in concise sound bites and not go on and on and on, like I did with Spike Lee once upon a time. Chomsky views it as a conspiracy—television producers end up using that criterion to decide whether they want you as a guest—not whether you're the world's top expert on the topic they are covering but whether you are able to shut up when needed. Chomsky does not accept this idea of keeping things brief, and in the movie he seems proud of and

rebellious about it.

Well, what he calls a conspiracy, I call just plain common sense. It is a basic conversational skill to be able to listen while talking so you can recognize when you're boring your audience. A lot of intellectuals, once again preconditioned from too many years of lecturing to prearoused students, have lost this ability to self-edit. Judging from Chomsky's comments in the documentary, he is one of the worst.

And this brings us to the idea of the “elevator pitch”: the ability to explain your project, whatever it is, so succinctly that you could get all the way through it in a single elevator ride. How do you do this most effectively? By having a clear structure to your information, using the basic three acts I've talked about.

You set up your subject (first act), give it the twist at the end of the first act (first plot point), explore several possible ways to untwist it and relieve the tension (second act), reveal a possible solution (second plot point), and then weave all the content together to release the source of tension (third act).

Something like this: “I study a starfish on the California coast—the only species that spawns in the dead of winter. I thought it might be due to predators of the eggs being less common at that time of year, then I thought it was due to the best timing for the spring algae bloom, but now it looks like it probably has something to do with a seasonal migration of the starfish, which is what I now study—the way that spawning season might be related to adult movements of starfish.”

“Starfish on the California coast” is the first-act setup. “The only species” is the establishment of tension (sets up the question “Why is it different?”). “Predators” and “algae bloom” are the multiple themes of the second act. “Seasonal migration” is the relief of tension, and “what I now study” is the third-act wrap-up.

And there's the shorter version, for the single-floor elevator ride, which is only a single line—“I study the one species of starfish that spawns in

the dead of winter instead of during the vibrant spring season." That's enough to establish the sort of tension ("Why is this starfish different?") that will leave the listener still thinking and interested when you step out of the elevator on your floor.

This shorter version is the same as what is called "high concept" in Hollywood, the telling of an entire story in a single sentence or phrase. I'm sure you've heard the ultimate example of this—"snakes on a plane," which actually ended up being the title of a mediocre 2006 movie. It's usually the mixing of two simple elements, each of which tells its own story—"snakes" signifies a dangerous thing that you'd better not let loose, "a plane" signifies a confined space in which you wouldn't want something dangerous loose. The combination instantly fires up your imagination, which is the goal of a good story.

For the elevator pitch, "spawning starfish" signifies something that needs to happen when things are alive and conducive to the survival of the spawn, and "dead of winter" signifies the worst time of the year.

Concision versus "Dumbing Down"

One of the criticisms of *Flock of Dodos* (as I've mentioned, there were many—particularly from the science bloggers) was that I was advocating the "dumbing down" of science. But I was actually trying to do just the opposite.

Let's look at the difference in these two terms. "Dumbing down" refers to the assumption that your audience is too stupid to understand your topic. So you water down all the information or just remove it, producing a vacuous and uninteresting version of what in reality is complex and fascinating. "Concision" is completely different. It means conveying a great deal of information using the fewest possible steps or words or images or whatever the mode of communication is. The former results in a dull, shallow presentation; the latter is a thing of beauty that can project infinite complexity.

Just ask a mathematician about concision. It's the difference between the clumsy mathematician who needs 100 steps to solve an equation and the skilled one who can do it in 5 simple steps. The latter is arrived at either by genius or by hard work. And that's all I'm advocating for science communication—that you be either a genius or a hard worker. That you accept that poor communicators are able to say the same basic things as good communicators—they just need a lot more time and space in which to do it, which ends up boring everyone.

Neil deGrasse Tyson and a Well-Told Story about *Titanic*

So let me tie this chapter up into a neat little package by showing (rather than telling) the real-world power of a well-told story.

Astronomer Neil deGrasse Tyson is the sort of natural born storyteller that the science world desperately needs. I attended a Hollywood event where he spoke and showed what I mean. The event was put on by the National Academy of Sciences as part of its new Science and Entertainment Exchange program, which is an effort to help improve the accuracy of science in movies and television.

Tyson talked about the movie *Titanic*. At the end, when the ship has sunk and everyone is floating in the North Atlantic Ocean, you can see the stars in the night sky above them. But when he first saw the movie in a theater, Tyson noticed something very troubling. As he explains it, there are only two sets of stars the moviemakers could have put up in the sky—the right ones (the Northern Hemisphere constellations) or the wrong ones (the Southern Hemisphere constellations)—so they had a fifty-fifty shot of getting it right. Guess which one they chose.

He said it spoiled the movie for him (typical scientist!), but a couple years later he was walking down the street in New York City and happened to randomly spot the director of the movie, James Cameron. He introduced himself and politely told him of the mistake. He said that Cameron took it in for a second, thought it through, and then sarcastically

said, “Gee, I bet if we hadn't made that mistake the movie would have made a couple hundred million more at the box office.”

But there's more to the story. Tyson said that in 2005 he got a call. It was one of Cameron's producers, who said they were re-editing the movie for the ten-year anniversary DVD edition, and “Mr. Cameron said you have some suggestions for us about our stars.”

Now, that is a good story. Three months later, I told it at the beginning of a workshop on storytelling. Two days after that, at the end of the workshop, without forewarning and after subjecting the students to a two-day “information storm” of lectures and discussions on a wide variety of subjects, I closed the workshop by asking if anyone could remember anything at all about Tyson's “*Titanic* story.” What they said surprised even me. A woman recounted the story with complete precision. And most everyone else in the class, while impressed with her performance, said they could probably have done just about as good of a job. Bottom line: it made them believers in the power of a well-told story.

Tyson's story is so effective in part because it has the basic elements of three-act structure. It has a beginning that sets up the theme (inaccuracy of science in big-budget movies), it has a middle that takes us to the opposite place from where we were hoping to go to (the hopelessness of it all when Cameron ridicules the inaccuracy), and an ending that is truly uplifting and satisfying (the sign of hope for humanity when it turns out Cameron was in fact troubled by the inaccuracy).

That is the power of storytelling laid bare. If you can encapsulate your message to the general public in a story as amusing, as compelling (with clearly dramatic highs and lows), and as concise as that, you could . . . well, for starters you could maybe end up as popular and effective a science communicator as Neil deGrasse Tyson!

Being able to tell a concise, interesting, and entertaining story that also conveys substance is a trait that everybody likes. And that brings us to our next chapter, on the importance of creating a likeable voice—the last

of my admonitions about being “such” a scientist.