ESSAYS ON SCIENCE AND SOCIETY

Ritual Abuse, Hot Air, and Missed Opportunities

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Scientists often complain to me that the media misunderstands their work. But, in fact, the reality is just the opposite: It is science that misunderstands media.

Two recent—and typical—examples of this misapprehension come to mind. An essay in the excellent journal *The Sciences* entitled "Script Doctors," has a subtitle that reads "Movie scientists, from evil doctors to the merely insane, from bumbling nerds to stalwart heroes, still inform public perceptions of the real thing."* Notice how arbitrary these characterizations are. The illustrations show an old version of *Dr. Jekyll and Mr. Hyde* and a still from *Indiana Jones and the Temple of Doom*. But Stevenson's story isn't about science, it's about the dual nature of man. And Indiana Jones is not a figure that leaps to mind when we think of scientists in movies. He's an adventurer. The film *Temple of Doom* is, like *Gunga Din* before it, a story about a murderous religious cult. To identify these pictures as representations of scientists is a long stretch.

Another page from the same article shows a nasty-looking fellow from a movie no one has ever seen called *Reanimator*, based on an H. P. Lovecraft story. On the same page is Sharon Stone, from a movie I co-produced, *Sphere*. You may not like the flawed character she plays—the reviewer doesn't—but why single her out, rather than the characters played by Dustin Hoffman, or Sam Jackson, or Peter Coyote? Everybody in *Sphere* is a scientist. Do you expect them all to be admirably portrayed? If so, do you think that corresponds to real life?

I sometimes think scientists really don't notice that their colleagues have flaws. But in my experience, scientists are very human people: Some are troubled, some are deceitful, petty, or vain. I know a scientist so forgetful he didn't notice he'd left his wife behind at the airport until the plane was in the air. I once was at a party with Jacques Monod when a gorgeous young woman—a Ph.D. bacteriologist—came up to him and said, "Oh, Dr. Monod, you are the most beautiful man in the room." And he *preened*. But why not? He was very handsome in a sort of Camus-existential-Gauloise-smoking way.

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I find these flaws reassuring, but an article like the one in *The Sciences*, which primarily focuses on negative rather than positive images, is a perennial exercise in self-flagellation, what I call ritual abuse. The implication is that scientists are singled out for negative portrayals, and that the public is therefore deceived in some way we should worry about. I say, that's nonsense.

All professions look bad in the movies. And there's a good reason for this. Movies don't portray career paths, they conscript interesting life-styles to serve a plot. So, lawyers are all unscrupulous and doctors are all uncaring. Psychiatrists are all crazy, and politicians are all corrupt. All cops are psychopaths, and all businessmen are crooks. Even moviemakers come off badly: directors are megalomaniacs, actors are spoiled brats. Since all occupations are portrayed negatively, why expect scientists to be treated differently?

But wait, you may be thinking. Don't these movie images provide some insight into the attitudes of the wider society? Don't they reflect society in some way? No, they do not. For proof of that, you need only look at images of women in the last 50 years. Fifty years ago, movies were characterized by strong women—Crawford and Stanwyck and Bette Davis. Women of intelligence and substance, women to be reckoned with. Since then, during a time of dramatic change for women in society, the movies have portrayed women primarily as giggling idiots or prostitutes. So I suggest to you there is essentially no correspondence between social reality and movie reality. None at all. And hence no point in worrying about movie portrayals.

A recent article from the *New York Times* is entitled: "Scientists seek a new movie role, hero not villain."† Again, notice the arbitrary nature of that dichotomy. We see three illustrations: Charlie Chaplin in *Modern Times*, a movie that is mentioned as critical of technology. Charlie Chaplin is run off his feet by racing technology. Imagine feeling that way! But of course it's a comedy.

Next, *Jurassic Park*, where the caption reads, "Scientists as bunglers: Richard Attenborough, left, hatches a deadly dinosaur." But Richard Attenborough is not a scientist, he's a businessman. The other two people in the picture are scientists, and they have had nothing to do with the bungling. Indeed, the scientist on the right is about to complain about the bungling, as any sensible person would. How does this moment get encapsulated as "Scientists as bunglers"?

In passing, I remind you *Jurassic Park* does have a scientist as its hero, Alan

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*M. Z. Ribalow, *The Sciences* (November/December 1998), pp. 26–31.
†A. Pollack, *The New York Times* (1 December 1998), p. F1.
‡G. J. E. Rawlins, *Slaves of the Machine* (MIT Press, Cambridge, MA, 1998).

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Grant. He saves the kids, he saves the day, rights the wrongs, and looks dashing the whole time. Beside him is another hero, Ellie Sattler, a botanist. So in a movie where nearly every character has a doctorate, why talk about wanting to be heroes not villains? The scientists already are heroes. Why are they so insistent on discounting the positive portrayals? Ritual abuse.

The third picture, from the movie *Contact.* The caption here is "Real science: Jodie Foster's driven search for extraterrestrial life won plaudits from astronomers." We all know what that means. Some of the background is authentic, or some technical dialogue is good, or the filmmakers went to Puerto Rico and filmed an actual radio telescope. But to call a movie about contact with extraterrestrial life an example of real science is very odd, indeed.

Even more interesting than images of scientists is how the scientific method is portrayed in fiction. I've said that scientists don't understand media, and one form of misunderstanding concerns why stories about the scientific method are as they are. I hear four principal complaints: (i) Unnecessary Added Plot (sex, violence, explosions, et cetera), (ii) Inaccurate and Implausible Plot Devices, (iii) Fear-Based and Negative Tone, and (iv) Why Not Show the Real Method? Let's discuss these in order.

Why are unnecessary razzle-dazzle and exaggerated plot elements meretriciously added? Well, because it's a movie. Movies tell larger-than-life, exaggerated stories. Most feature sex and violence and explosions whenever possible.

A variant complaint is to say the story doesn't need one or another element. Oxford biologist Richard Dawkins, whom I very much admire, is quoted as saying "the natural world is fascinating in its own right. It really doesn't need human drama to be fascinating."† And he wondered why *Jurassic Park* had to have any people in it at all, when it already had dinosaurs.

Of course the natural world is fascinating in its own right, but *Jurassic Park* isn't the natural world. The jungle is on a soundstage at Universal. It has been built to suit the action; if an actor has to climb a tree, the Fiberglas bark is supported inside with metal girders to hold the weight. It is lit by artificial light. And for the most part, the dinosaurs aren't on this set at all: they're added later by computer. Furthermore, it's not as if the dinosaurs had some inherent accuracy and the people are added fictions. It's all equally fictitious. No one knows what dinosaurs looked like or how they behaved. The film portrayal of dinosaurs is fantasy. A novelist imagined their behavior. Artists imagined their appearance. There is nothing remotely real about them.

But let's imagine, for a moment, that dinosaurs were real, and you could film a sort of Discovery Channel segment about them. Would that film be real? Are any of the nature films we see on television "real"? For the most part, no, because those films take raw footage, sometimes filmed over years, and cut it together to make a familiar narrative: The young cub goes on its own, meeting amusement and danger. Mother protects and defends her cute babies. The male is banished from his harem and sulks. And so on. These stories frequently do not occur in front of the cameras. They occur in the editing room. Why are the films cut that way? Because people like stories. They find sequential narratives, even when palpably untrue, interesting and organizing. In fact when people go on safari to Africa they're disappointed to find the animals aren't acting out the little half-hour vignettes they've come to expect from TV. When they do find a real life episode, it often lasts too long: a dominance fight between hippos can go on for hours. With no convenient commercial breaks in which to change film and go to the bathroom.

> "*Jurassic Park* does have a scientist as its hero, Alan Grant. He saves the kids, he saves the day, rights the wrongs, and looks dashing the whole time."

Let's go to the second point, inaccuracy and made-up plot devices. Scientists from Leo Szilard to Isaac Asimov to Carl Sagan have all written fiction—and all have unhesitatingly used inaccurate and gratuitous plot devices. There must be a reason. Carl invented a message, he invented a machine, and he invented an extraterrestrial life. None of this could be called accurate in any reasonable sense of the word. It's fantasy. Asimov is best known for his *I, Robot* series. No accuracy there.

In a story like *Jurassic Park,* to complain of inaccuracy is downright weird. Nobody can make a dinosaur. Therefore the story is a fantasy. How can accuracy have any meaning in a fantasy? It's like the reporters who asked me if I had visited genetic engineering firms while doing my research. Why would I? They don't know how to make a dinosaur.

Point three. Why are the stories about science always so negative? Why can't we have positive stories? One answer is that people like scary movies. They enjoy being frightened. But the more important answer is that we live in a culture of relentless, round-the-clock boosterism for science and technology. With each new discovery and invention, the virtues are always oversold, the drawbacks understated. Who can forget the freely mobile society of the automobile, the friendly atom, the paperless office, the impending crisis of too much leisure time, or the era of universal education ushered in by television? We now hear the same utopian claims about the Internet. But everyone knows science and technology are inevitably a mixed blessing. How then will the fears, the concerns, the downside of technology be expressed? Because it has to appear somewhere. So it appears in movies, in stories—which I would argue is a good place for it to appear.

And let's remember there is genuine reason for concern. As Paul Valery put it, "The whole question comes down to this: can the human mind master what the human mind has made?"‡ That's the question that troubled Oppenheimer. It troubled the editors of the *Bulletin of the Atomic Scientists*. It troubles many scientists now. And it should.

Finally, our society is now dependent on technology, and dependent on science. With so much power, science will inevitably receive strong criticism. It comes with success. It's entirely appropriate. Take it as a compliment. And get over it.

And so we come to point four. Why not show the real scientific method in stories?

The *New York Times* article quotes my friend David Milch, a creator of *NYPD Blue.* His answer is blunt: "the scientific method is antithetical to storytelling." And he's right, at least for movies. Movies are a special kind of storytelling, with their own requirements and rules. Here are four important ones: (i) Movie characters must be compelled to act. (ii) Movies need villains. (iii) Movie searches are dull. (iv) Movies must move.

Unfortunately, the scientific method runs up against all four rules. In real life, scientists may compete, they may be driven—but they aren't forced to work. Yet movies work best when characters have no choice. That's why there is the long narrative tradition of contrived compulsion for scientists. In *Flash Gordon*, Dr. Zharkov must work or else Dale Arden will be fondled by Ming the Merciless. In countless other stories, the scientist was given a daughter, so she could be captured by the bad guys, to force the scientist to work. An-

other time-honored method to compel is to build in a clock, as I did in *The Andromeda Strain.* You must accomplish a task before something awful happens. Or you can murder the character's family, thus forcing him to track down the bad guys. But however you do it, the end result is always the same: The movie character is compelled to act.

Second, the villain. Real scientists may be challenged by nature, but they aren't opposed by a human villain. Yet movies need a human personification of evil. You can't make one without distorting the truth of science.

Third, searches. Scientific work is often an extended search. But movies can't sustain a search, which is why they either run a parallel plotline, or more often, just cut the search short. There's a fabulous sequence in *The French Connection* where the cops spend all night tearing apart a car, searching for cocaine. But on film it only lasts about 30 seconds. Whereas if you short-circuit the search in science, you aren't faithful to the nature of research.

Fourth, the matter of physical action: Movies must move. Movies are visual and external. But much of the action of science is internal and intellectual, with little to show in the way of physical activity. Even the settings of science are unsatisfactory: contemporary laboratories aren't physically active like the bubbling reagents and lightning sparks of the old *Frankenstein.*

For all these reasons, the scientific method presents genuine problems in film storytelling. The problems are insoluble. The best you will ever get is a kind of caricature of the scientific process. Nor will the problems be solved by finding a more intelligent, dedicated, or caring filmmaker. The problems lie with the limitations of film as a visual storytelling medium. You aren't going to beat it.

I have suggested that negative and distorted views of scientists and the scientific method are inevitable. But I've also suggested that it's all unimportant, and that worrying about it is a lot of hot air.

What then should scientists be concerned about? What really matters is not the image, but the reality. Adopting this attitude has the advantage of turning your focus from things you can't do anything about—like scientists in the movies—to things you can.

If I were magically put in charge of improving the status and image of science, I'd start using the media, instead of feeling victimized by them. The information society will be dominated by the groups of people who are most skilled at manipulating the media for their own ends. Under the auspices of a distinguished organization—like AAAS—I'd set up a service bureau for reporters. Reporters are harried, and often don't know science. A phone call away, establish a source of information to help them, to verify facts, to assist them through thorny issues. Over time, build this bureau into a kind of *Good Housekeeping* seal, so that your denial has power, and you can start knocking down phony stories, fake statistics, and pointless scares immediately, before they build. And use this bureau to refer reporters to scientists around the country who can speak clearly to specific issues, who are quotable, and who can eventually emerge as recognizable spokespeople for science in areas of public concern, like electromagnetic radiation scares, cancer diets, and breast implant litigation. Convince these scientists that appearing on media isn't an ego trip, but is part of their job, and a service to their profession. Then convince their colleagues.

Because this pool of scientists will eventually produce media stars, you need the profession to respect them, instead of making their lives hell. Carl Sagan took incredible flak from colleagues, yet he performed a great service to science. So too, at an earlier time, did Jacob Bronowski, who similarly bore heavy criticism. I am sure there are scientists today who might become media figures but don't because they correctly foresee professional scorn. All this must change. Science has dealt with its disdain of the press by turning media work over to popularizers. But popularizers can't do what needs to be done, because people see they aren't really scientists, they're just well-informed talkers.

You need working scientists with major reputations and major accomplishments to appear regularly on the media, and thus act as human examples, demonstrating by their presence what a scientist is, how a scientist thinks and acts, and explaining what science is about. Such media-savvy people are found in sports, politics, business, law, and medicine. Science needs them too. And it doesn't hurt if they're characters: Richard Feynmann, with his strip-tease lunches and pranks and bongo drums, did much to put a human face on physics. He, too, was criticized.

I recognize that to build a pool of media stars is going to take a minor revolution in professional attitudes. But you have no choice. I hope I have convinced you that you can never convey a sense of real science through movies or TV shows. You can only do that by exposing real scientists, with wit and charisma, to the waiting public in the media and in the classroom.

Finally, I would rethink the advancement of science. Too often, the advancement of science has meant the advancement of scientists. More money for research, more spending for big projects. The public correctly perceives this as lobbying. Instead, I would improve the image of science by helping people with problems they can't solve. A few years ago, the American public expressed enormous concern about drugs; half of all Americans reported they personally knew someone who had gotten in trouble with drugs. Now our schools are flooded with some 50 drug prevention programs: federal money pays for them, but nobody knows which, if any, work. Similarly, drug rehabilitation succeeds only about a third of the time. Which programs perform best? What factors improve outcomes? Science has the means and the tools to help here.

So let's stop the self-flagellation, the ritual abuse and the hot air, and follow some new paths. Science is the most exciting and sustained enterprise of discovery in the history of our species. It is the great adventure of our time. In a stunningly short period of time, science has extended our knowledge all the way from the behavior of galaxies to the behavior of particles in the subatomic world. Under the circumstances, for scientists to fret over their image seems absurd. This is a great field with great talents and great power. It's time to assume your power, and shoulder your responsibility to get your message to the waiting world. It's nobody's job but yours. And nobody can do it as well as you can.

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