

# Pedestrian Tools and Character-driven Science: How *Bones* Helped Me Rethink My Research

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## ABSTRACT

In this paper I develop analogies between television shows that involve collaborative science work and my own research on geographically distributed science teams. My goal is to use popularized science to get us to think differently about our own research. I use examples from the forensics drama *Bones* and data from my current study of post doctoral researchers and their labs to examine how we make sense of scientific collaboration and the tools used to accomplish science. I argue that we should focus more on the pedestrian tools scientists use to accomplish their work and to carefully study the scientists themselves and not just their tasks.

## INTRODUCTION

Often, when we talk about scientific collaboration, we emphasize “big science,” the kinds done in large-scale projects such as the Network for Earthquake Engineering Cyberinfrastructure Center<sup>1</sup> or Network for Computation Nanotechnology<sup>2</sup>. We label the technologies used to support such science “cyberinfrastructure.” Previous work on cyberinfrastructure and scientific collaboration has argued that “cyberinfrastructure technologies ... cannot be plucked off the shelf” (Lee, Dourish, & Mark, 2006). I disagree, and I’ll use examples from *Bones* and data from one of my current studies of scientific collaborations to show you why.

## RESEARCH SETTING

Newcomers to laboratories (e.g. post-doctoral fellows) must learn new techniques, navigate a new social network, and work within unfamiliar organizational structures. The growing pressure for “bigger science” combined with the technological capacity to communicate over distance has increased interest in the promise of cyberinfrastructure-enabled virtual science research teams (Atkins et al., 2003). Joining a virtual research organization may prove even more difficult for newcomers. Organizational socialization focuses on newcomers’ adjustments to new surroundings (Fisher, 1986; Saks, Uggerslev, & Fassina, 2007; Van Maanen & Schein, 1979). Traditional organizations have begun to focus on the processes of “onboarding” to facilitate newcomers’ learning and adjustment (see Saks et al., 2007 for an overview). Scientific research organizations face similar problems of socialization and onboarding. I am currently engaged in a qualitative study of post docs joining geographically distributed science teams in order to understand what factors lead to successful onboarding in science teams. Here I have referenced interviews with the participant’s initials and the approximate date of the interview (e.g., WM, 11/09).

## Excerpt 1: The Verdict in the Story

(Clark brings up the skull, with the wound, on the screen)

CLARK: Can you discern any microfractures in that photo?

ZACK: Yes. (he had a realization) Oh...

CLARK: You sound surprised, Dr. Addy.

ZACK: What did you stain this with?

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<sup>1</sup> <http://legacy-it.nees.org/about/index.php>

<sup>2</sup> <http://nanohub.org/about>

CLARK: Red food dye. Can you answer the question please?

ZACK: Oh. These microfractures indicate that the weapon went in so deep that the hilt hit the bone, causing microfractures

CLARK: The hilt. (He holds up the bag with the pipe in it) Could you please indicate the hilt on this weapon?

ZACK: I cannot.

CLARK: And why is that?

ZACK: There is no hilt.

CLARK: So this is not the murder weapon.

ZACK: Obviously not.

(Courtroom murmurs.)

CLARK: You made a mistake.

ZACK: Yes, I was mistaken.

### PEDESTRAIN TOOLS AND BIG SCIENCE

The excerpt above is from “The Verdict in the Story” (*Bones*, Season 3 Episode 13). Zack is a forensic anthropologist testifying in a murder trial. He had identified a murder weapon based on the damage it left on a victim’s skull. Clark is another forensic anthropologist questioning Zack; he, too, had examined the damage to the victim’s skull. Using different tools, in this case red food dye, Clark found different kinds of damage than did Zack. This excerpt has many potential lessons for researchers studying science, but the one on which I’d like to focus is this: Clark, using red food dye, a rather pedestrian tool, was able to do really good science. This message – that good science can get done with pedestrian tools – is incredibly important for researchers who study scientific collaboration to learn.

It seems that we often get wrapped up in the idea that big science takes big tools, but I’m finding that a distinct “cyberinfrastructure” is not the most important missing piece. In my own work, I study post doctoral researchers (post docs) who have joined geographically distributed scientific teams. My participants are trying to decipher the evolution of fish in the Amazonian region, to describe the chemical behaviors of toxic algae in Midwestern lakes, to understand the relationship among Giant Panda, man, and environment. My participants claim, “The science you do nowadays, you can’t do by yourself ‘cause it’s too big, and you don’t ever have the expertise for all the things you want to do” (KM, 11/09). They are not working as part of large-scale networked, cyberinfrastructure-enabled centers, and yet, their science is big; it requires collaboration.

So how do they accomplish this big science without cyberinfrastructure?

- “I will often use Skype, especially if I’m working with people internationally.” (CS, 03/09)
- “[A student] implemented a piece of software for version control. It’s called Versions or Subversions (*sic*) on a Mac.” (TM, 11/09)
- “We’ve had grad students or other researchers who are in the field at the time doing on projects and joined this by a combination of telephone and shared PowerPoint.” (WM, 03/09)

Like Clark and the red food dye, science collaborations use what cyberinfrastructure researchers consider pedestrian technologies – Skype, Powerpoint, Subversion – to do science. Our continued emphasis on large-scale science networks wrongfully ignores or undervalues the important day-to-day work involved in scientific collaboration.

### CHARACTER-DRIVEN RESEARCH

One of the many reasons *Bones* is a successful television show is that its scripts are character-driven, and this emphasis on character sets it apart from other forensics dramas like *CSI* (Keller, 2008). This means that the characters, and not the plot, are the central feature of the show. The actors on *Bones* point to this character emphasis when discussing the show and their involvement, and viewers point to it as well. Character-driven fiction is recognized as more compelling than its plot-driven counterpart (Horton, 2000). In my interviews with post docs and their advisors, I find a similar preference for the compelling over the merely active.

For instance, when describing how they came to work in their current positions, post docs claim they took the positions to gain skills, to develop professionally, to become a certain kind a scientist. Sure, they are getting some science done, but the activity of the science is not what they point to when describing the motivations for taking a particular position. I find the “character-driven versus plot-driven” analogy useful when trying to describe a disconnect between what my participants tell me about their work and what the existing literature on scientific collaboration has to say. Instead of focusing on the tools used and the plot of the science to be done, we should focus instead on the characters doing science.

#### Excerpt 2: Pilot

Booth: (approaching pond where there is a boat waiting) He’s got no sense of discretion. That kid. Typical squint.

Bones: I don’t know what that means.

Booth: Well when the cops get stuck we bring in people like you. You know squints. You know to squint at things.

Bones: (stops walking and faces him) Oh you mean people with very high IQs and basic reasoning skills. (tosses her bag at Booth who catches it)

Excerpt 2 comes from the Pilot episode of *Bones* where we meet Booth, an FBI agent, and Bones, a forensic anthropologist who analyzes human remains to help the FBI solve crime. Booth and Bones are different types of people – a cop and a squint – with different traits – e.g., high IQs.

Character-driven narratives rely on traits – “relatively stable or abiding personal qualities” (Chatman, 2006, p. 126). Character-driven stories develop from these traits and character’s motivations and drive the plot. Some earlier work has discussed the characters involved in scientific collaborations (e.g., Finholt & Birnholtz, 2006; Lee et al., 2006). Technology development has a history of engaging potential users, or at the very least descriptions of those users, in design (see Holtzblatt, Barr, & Holtzblatt, 2009). However, our attempts at designing scenarios to inform design fall short of providing insight into users as people (Nielsen, 2002). Going forward, we should endeavor to capture and understand characters engaged in scientific collaboration. We often discuss scientific collaboration as problem-driven or funder-driven, but a renewed attention to characters – an emphasis on scientist-driven collaboration – may lead us to new understandings of how science gets done and how to design tools that support scientists rather than just the science itself.

#### CONCLUSION

Throughout my tenure studying scientific collaboration, I have been frustrated with an emphasis on the tasks of science, on the problems science is trying to solve. We spend millions to build large-scale networked, infrastructural support for the tasks of science, for its plots. Instead, we should recognize the great science that gets done using pedestrian tools like Skype that rely on existing infrastructure that is not science-specific. We should also refocus our inquiry on the scientists, the characters of science. We should understand their motivations, their traits, and let them drive our research. It may be that the computer science – social science collaborations that many cyberinfrastructure studies produce are misguided. In my experience, such projects are still focused on tools and products instead of on people and their activities. We have a lot to learn from scientists who work with what they have – it may take something as simple as red food dye to show us our research efforts have been missing something.

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