Psychology and Astrophysics: Overcoming Physics Envy

By R. Michael Furr

I am not an astrophysicist, but I have seen one on TV. A cable channel recently aired a program called "Supermassive Black Holes," and sometimes even cable TV can get a person thinking.... What in the world (so to speak) do Black Holes have to do with social and personality psychology? A consideration of how astrophysicists conduct their research reveals some interesting parallels with psychology.

1. Unobservable constructs

Some key constructs in astrophysics are not directly observable but are instead *inferred* from the behavior of entities that can be observed. A classic example is gravity. As described in a recent introductory physics book (Seaborn, 1998), Galileo astutely noticed, among other things, that cannonballs tend to fall to earth. He conducted research to describe the relations between muzzle velocity, trajectory, and distance of cannonball flight. Later, Newton drew a parallel between the behavior of cannonballs, the behavior of the moon, and, as legend has it, the behavior of apples. From the behavior of such *observable* entities, Newton posited the existence of an *unobservable* force that he called "gravity" and eventually published a law of universal gravitation. So far, this idea has worked out pretty well.

A bit more recently, and a bit closer to intellectual home, MacCorquodale and Meehl (1948) noted the self-consciousness that psychologists seem to feel when daring to posit the existence of unobservable or hypothetical constructs, and they contrasted this with the apparent comfort felt by physicists. Of course, MacCorquodale and Meehl go on to point out that not all unobservable constructs are equal. Are gravity, black holes, short term memory, and the superego on equal scientific footing? Perhaps not. Nevertheless, to the degree that research finds, or even *might* find, physiological bases (or correlates) of constructs such as Memory. Intelligence, or Extraversion (e.g., Zuckerman, 1995), we might feel more and more confident in positing and defending the existence of such unobservable constructs.

2. Correlational research

Astrophysicists working with galaxies cannot do too many experimental manipulations, but they seem to get by. One astrophysicist interviewed on the "Supermassive" TV show proudly claimed that "what we do is to search for correlations." The point here is that the underlying correlational methodology and analysis is the same as that used in some of the "softer" areas of psychology. What is odd, though, is that an undergraduate reading the typical textbook in psychological research methods could be forgiven for believing that "correlational" research is a second-class substitute for good experimental research.

Consider a recent investigation of the correlation between the mass of the black hole at the center of a galaxy and the average velocity of stars at the edge of the galaxy (Gebhardt et al., 2000). This correlational study has such crucial implications that some claim "it almost has the status of a new law of nature" (Musser, 2000). OK, so the correlation is .93, which is a bit larger than the effect sizes typically found in Psychology (by the way, it was statistically significant). Still, not bad for what sometimes comes across as a second-class methodology.

3. Error and aggregation in measurement

How does one obtain an accurate image of a star? One strategy that astrophysicists use is to take multiple pictures of the star and aggregate over pictures (e.g., Ghez, Morris, Becklin, Tanner, & Kremenek, 2000). Why? Because each single picture (i.e., item) is affected by error, such as atmospheric disturbances. By aggregating over the images, the random error washes out, leaving a nice clear image of the star itself. There are a variety of other sources of error and a corresponding variety of corrections that Astrophysicists use, but the basic logic of measurement error and aggregation could be straight from the discussion of reliability found in a typical psychometric textbook.

4. Concern over generalizability

This includes at least two issues that psychologists might recognize as random sampling and cohort effects. At least one astrophysicist has admitted the possibility that findings on which much of the science is based may be of limited generalizability. For example, Harwit (1998) states that the knowledge of large-scale dynamics is based on extrapolations made from research on our Solar System, and he suggests that there is "no guarantee that this extrapolation is warranted" (p. 9). Even more intriguing than this issue of "convenience sampling," is a recent study that has been interpreted as showing that the very laws of nature might be changing as the universe ages (Webb et al., 2001). One might ponder the parallels between the study of "our Solar System as it appears in the year 2001" and the study of "American undergraduates in the year 2001." In both cases, might one question the ability to generalize across "subjects" and time?

I hope that this brief survey of similarities will not be interpreted as another case of "physics envy." Clearly, it omits the important and

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fundamental differences in the nature of research and the overall progress of the two sciences. Nevertheless, it is often useful to step back for a different perspective on what we do and how we do it. For myself, the more I learn about what other sciences do and the challenges that they face, the more I feel that we do quite well for ourselves.

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Ageism: Stereotyping and Prejudice Against Older Persons. (2002). Edited by T. D. Nelson. MIT Press.

In social perception, people tend to automatically categorize others along three major dimensions: race, sex, and age (Kunda, 1999). While much empirical and theoretical attention has been devoted to the study of racism and sexism, comparatively little research in psychology has been directed at understanding what some refer to as the "third ism," ageism (Barrow & Smith, 1979). But why? There are a myriad of possible reasons, but perhaps the most obvious is that age prejudice is one of the most socially-condoned, institutionalized forms of prejudice in the world - and especially in the United States. As you will see in reading the chapters of this volume, most Americans tend to have little tolerance for older persons, and have very few reservations about harboring negative attitudes toward older people. Whatever the reasons for the comparative dearth of theoretical and empirical research on ageism among psychologists, it is clear that much more research is needed. This volume addresses ageism from several different perspectives (e.g., gerontology, communication, psychology), and the distinguished chapter authors present the latest theoretical and empirical advances in our understanding of the causes and effects of ageism.

Table of Contents: *Doddering but dear: Process, content and function in stereotyping of older persons;* Cuddy & Fiske; *Ageism: Denying the face of the future;* Greenberg, Schimel, & Mertens; *Implicit ageism;* Levy & Banaji; *A social-developmental view of ageism;* Montepare & Zebrowitz; *Attitudes toward older adults;* Kite & Wagner; *Ageism in the workplace: A communication perspective;* McCann & Giles; *Ageist behavior;* Pasupathi & Lockenhoff; *The paradox of well-being, identity processes, and stereotype threat: Ageism and its potential relationships to the self in later life;* Whitbourne & Sneed; *Acting your age;* Golub, Filipowicz & Langer; *Will families support their elders? Answers from across cultures;* Ng; *Reducing ageism;* Braithwaite; *30 years of ageism research;* Wilkinson & Ferraro.■

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Dialogue is the official newsletter of the Society for Personality and Social Psychology. It appears twice every year, in the spring and fall. Its intended readership is members of the Society. The purpose of *Dialogue* is to report news of the Society, stimulate debate on issues, and generally inform and occasionally entertain. *Dialogue* publishes summaries about meetings of the Society's executive committee and subcommittees, as well as announcements, opinion pieces, letters to the editor, humor, and other articles of general interest to personality and social psychologists. The Editors seek to publish all relevant and appropriate contributions, although the Editors reserve the right to determine publishability. Content may be solicited by the Editors or offered, unsolicited, by members. News of the Society and Committee Reports are reviewed for accuracy and content by officers or committee chairs of SPSP. All other content is reviewed at the discretion of the Editors.

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Chris Chambers: The physical sciences may be centuries ahead of psychology, but by listening and learning we have the chance to catch up.Â â€œI think this is the main driver in astrophysics â€“ we know that one group can screw up, or a fluke result can happen, and we take independent verification to be much more important than just a solid statistical analysis.â€ It is one thing to say that psychologists need to care more about reproducibility, but how do we make that happen within a juvenile academic culture that, above all, rewards novelty and creativity?Â Critics may argue that it isnâ€™t fair to judge psychology by the standards of physics, arguably the Olympic athlete of the sciences. On the other hand, perhaps this is precisely the goal we should set for ourselves. Physics and psychology are not at all mutually exclusive. In fact many of the more quantitative branches of psychology are populated by many people with degrees in physics as well as people from math, electrical engineering and computer science. If you have a background in physics and think the brain is important for understanding the mind, look into theoretical neuroscience. If you have the same background but don't think the specific architecture of the brain is quite as important then look into cognitive science. Feb 15, 2008.