



Duncan Luce Wins National Medal of Science

by Roberta L. Klatzky

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The National Medal of Science has been given to more than 400 distinguished recipients for their contributions to science and engineering. Although initially restricted to the physical, biological, mathematical, or engineering sciences, the domain was expanded by Congress in 1980 to include the social and behavioral sciences. Criteria for the award include an individual's total impact, significant achievements, distinguished service to advancing science and engineering, and peer recognition. This year's recipient, Duncan Luce, exemplifies every one of those criteria. The award joins many other honors awarded to Luce, including election to the American Academy of Arts and Sciences, the National Academy of Sciences and the American Philosophical Society, the 2004 Norman Anderson Award of the Society of Experimental Psychologists, the 2003 Frank P. Ramsey Medal of the Decision Analysis Society and the 2001 Gold Medal for Life Achievement in the Science of Psychology of the American Psychological Foundation.

Luce received a Mathematics PhD in 1950 from the Massachusetts Institute of Technology. His university appointments have included Columbia, Harvard, the University of Pennsylvania,

and UC Irvine. In 1988 he founded and assumed the directorship of the UCI Institute for Mathematical Behavioral Sciences, which he headed for 10 years. Currently he is UCI Distinguished Research Professor Emeritus of Cognitive Sciences and Economics.

Luce's work is both theoretical and empirical and above all, mathematically infused. It crosses boundaries among psychology, mathematics, and economics, always with an eye to understanding human behavior from a rigorous theoretical perspective. When asked to cite some of his research contributions that were "favorite children," Luce's list revealed the breadth of his contributions: reanalysis of Fechner's scaling method, the choice axiom, additive conjoint measurement (with J. W. Tukey), contributions to games and decision making, and his book *Response Times*. Of the choice axiom, which commonly bears his name, he noted that it is important not because it is always right - "it isn't" - but because it both provided a somewhat novel framework for thinking about probabilities and inspired others to study and apply several variants.

Luce also cited as career highlights the *Handbook of Mathematical Psychology* (with R. R. Bush and E. Galanter) and *Foundations of Measurement*

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New Psychologists Lend a Hand and NIH Repays the Favor

by Geoff Mumford, Director of Science Policy

Concerns about NIH activities have been front and center for APA these past few months. Whether the issue was programmatic support of basic psychological research or a new policy to archive NIH-funded research on a central publications database, APA member scientists and APA as a publishing house had plenty of reason to worry. While neither of those issues have been completely resolved we thought you could use a little good news and that comes in the form of data that science policy staff acquired on the NIH Loan Repayment Program (LRP).

The NIH Loan Repayment Program was devised to encourage budding health professionals to consider research careers in a set of specialty areas deemed most critical to the NIH mission in return for repayment of educational debt. Thus, NIH will pay

up to \$35,000 per year of qualified educational debt as well as the corresponding federal taxes (up to the 39% level) for post-docs who are accepted to one of the five LRP's: Clinical Research, Pediatric Research, Health Disparities Research, Clinical Research for Individuals from Disadvantaged Backgrounds, and Contraception and Infertility Research.

Last October NIH announced the award of 1,400 new LRP contracts and that made us wonder how well psychologists were faring in the competition and in the spirit of "it can't hurt to ask" - we did. Although it was a somewhat tortured exercise to extract the data, persistence paid off and we're grateful to Steve Boehlert, Director of Operations for the LRP and his staff for persevering. The good news is that in the aggregate data, representing the last two program years, fully 38% of

the awardees were psychologists. As one might expect, there was a broad range across the five programs such that no psychologists were represented in the Contraception and Infertility Research Program but 50% of the awardees were psychologists in the Health Disparities Research Program. In terms of raw numbers, the largest program is in Clinical Research where 42% of awards went to psychologists (table of 2003/2004 award data: <http://www.apa.org/science/psa/Psychologists2003.04.pdf>).

So at a time when the psychological science community is concerned about the marginalization of selected research programs at NIH, it is encouraging to see that psychologists are clearly so integral to this one. For more detail on the Loan Repayment Programs, see: <http://www.lrp.nih.gov/about/index.htm>. ■

Call for Nominations: APA Distinguished Science Awards

The APA Board of Scientific Affairs (BSA) invites nominations for its ongoing awards program. Awards are given in three categories: The Distinguished Scientific Contribution Award is presented to individuals who have made distinguished theoretical or empirical contributions to basic research in psychology. The Distinguished Scientific Award for the Applications of Psychology is given to individuals who have made exceptional theoretical or empirical advances in psychology leading to the understanding or amelioration of important practical problems.

To submit a nomination for the Distinguished Scientific Contribution Award and the Distinguished Scientific Contribution Award for the Applications of Psychology, you should provide a letter of nomination; the nominee's current vita with list of publications; the names and addresses of several scientists who are familiar with the nominee's work; and a list of ten most significant and representative publications, and at least five reprints representative of the nominee's contribution (reprints, preferably in electronic form). The Distinguished Scientific Award for Early Career Contribution to Psychology is awarded to outstanding young psychologists who are 9 years or less post-PhD (1996 or later). The 2006 Early Career Awards will be given in five areas: animal learning and behavior, comparative, psychopathology, health, developmental cognition/human learning

The categories should be interpreted broadly and are not meant to be exclusive; all areas of psychology are of sufficient merit to be considered for awards. To submit a nomination for the Distinguished Scientific Award for Early Career Contribution to Psychology, you should provide a letter of nomination, the nominee's current vita with list of publications, and up to five representative reprints.

To obtain nomination forms and more information, you can go to the Science Directorate web page (www.apa.org/science/sciaward.html) or you can contact Suzanne Wandersman, Science Directorate, American Psychological Association, 750 First Street, NE, Washington, DC 20002-4242; by phone, (202) 336-6000; by fax, (202) 336-5953; or by email at swandersman@apa.org. The deadline for all award nominations is **June 1, 2005**

EXECUTIVE DIRECTOR'S COLUMN

STEVEN BRECKLER, Executive Director for Science

A Golden Opportunity

The APA Board of Scientific Affairs and the APA Science Directorate have launched a major new initiative – Psychological Science for the 21st Century (Psy21). Built around three interlocking areas of emphasis, PSY21 provides the foundation on which APA will help to advance the science of psychology. The three areas of emphasis include:

- Responsible Conduct of Research
- Culture of Service to the Discipline
- Infrastructure for the Science of Psychology

I want to focus here on the third of these – infrastructure for the science of psychology. Infrastructure refers to shared and costly resources that support the work of scientists across the discipline. A good example is in the area of cognitive neuroscience, which depends on the availability of magnetic resonance imaging facilities and expertise. Another example is the growth of large-scale, sometimes longitudinal data sets. The PSY21 initiative will help to identify the infrastructure needs of psychological science, and will provide much needed advocacy for support by federal funding agencies.

Financial support is going to be critical for the development of our infrastructure. The tools and resources we need to move psychological science to the next level will be expensive. A sustained and intense advocacy and lobbying effort will be needed to secure the kind of funding it takes to develop and support significant infrastructure.

Against this backdrop, it is especially encouraging to see a new program solicitation from the National Science Foundation. NSF promises to invest \$4 million in Next Generation Cybertools,



specifically with application to complex behavior of organizations and individuals. This is a new competition for NSF, sponsored jointly by the Directorate for Social, Behavioral, and Economic Sciences (SBE) and the Directorate for Computer and Information Science and Engineering (CISE). This is big, and it is important.

NSF defines cybertools as “methodologies and tools for the representation and manipulation of large volumes of data for heterogeneous, multimodal sources, on either organizations or individuals.” Examples cited in the program solicitation include tools for social and behavioral informatics, and tools for information integration. The proposing teams must include relevant expertise from both the social and behavioral sciences and from computer science. Projects are more likely to succeed the more they span across the social and behavioral sciences, ideally connecting to other disciplines as well.

The collaboration with computer science is critical. This is a chance for social and behavioral scientists to work directly with computer scientists in developing tools and infrastructure in service of social and behavioral science. Psychological science currently relies on tools that were developed for other purposes – off-the-shelf hardware and

software, sometimes slightly modified, with which we make do. Imagine the new possibilities when advanced tools are developed from the outset with social and behavioral science needs and applications in mind.

It is important that psychology greet this funding opportunity with energy and enthusiasm. NSF will be encouraged to sustain such support if a large number of high-quality proposals get submitted for this competition. Who knows – future NSF competitions might encourage similar collaborations with engineering or mathematics, with the same goal of developing and enhancing the infrastructure of social and behavioral science.

The new program solicitation is posted on the NSF website at www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf05563. Follow the advice given in the program solicitation – contact the NSF program officers, and read the background documents on cyberinfrastructure. Submit a strong proposal, and you might find yourself at the leading edge of psychological science in the 21st century. ■

National Science Foundation's "Next Generation Cybertools"

The NSF's SBE and CISE directorates have released a new joint program announcement, “Next Generation Cybertools.” This program solicitation should be of interest to many in the psychology community. For additional information contact one of the program officers listed in the announcements:

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13553&org=SBE&from=home

http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=13553&org=CISE&from=home

New ATI Announced: Performing Psychology Experiments Via the Web

Details have recently been finalized for the fourth Advanced Training Institute (ATI) to be held over the summer: Performing Psychology Experiments Via the Web. Led by Michael Birnbaum at the California State University at Fullerton from July 19-23, this one will offer the most personal attention of all the ATIs: seven instructors will be on hand for just sixteen participants.

This Advanced Training Institute will prepare participants to design, execute, and analyze on-line experiments. Advantages of web-based research include low costs in lab space, assistants, data entry, and time in collecting data. It is possible to recruit large samples quickly via the Web and to reach specialized types of participants who are rare in the general population. There will be instruction on methods of recruitment, ethics reviews, methodological problems and issues such as drop out and multiple submission, recruitment and retention of Online Panels, and techniques for implementation and control of Web surveys and experiments.

Instruction will cover basic HTML, HTML forms, use of programs that create web forms for on-line research (surveyWiz, factorWiz, WWW Survey Assistant, WexTor), how to install and run your own server with the free Apache server; installation and use of MySQL database, PHP, and Perl; use of LogAnalyzer, Java Programming, Authorware for creating Web experiments that allow control and measurement of response time, preparation and control of visual and auditory media. All seven instructors are experts who have worked together and taught the material at least three times. Opportunities to interact with the instructors and receive individual attention will be provided.

Application deadline: **April 15**. For more information, visit http://www.apa.org/science/ati_wb_experiment.html. ■

Science Policy Insider News

What is SPIN?

APA's Science Policy staff wants you to know about the important policy issues that affect psychological science and psychological scientists at the national level. The Science Policy staff advocates for psychological science not just with members of Congress, but also the Departments of Defense, Health and Human Services, Transportation, Veterans Affairs, Education and with the National Aeronautics and Space Administration and National Science Foundation. To keep you aware of science policy within these agencies and on Capitol Hill, we have created APA's Science Policy Insider News (SPIN), a monthly email newsletter that will take you inside the Administration and Congress for timely information from your APA staff.

Visit SPIN at <http://www.apa.org/ppo/spin>.

(with D. H. Krantz, P. Suppes, and A. Tversky), both published as three-volume sets. He has had a number of significant collaborations, including two decades of interaction with Louis Narens on fundamental aspects of measurement and recent association with A. A. J. Marley and several functional equations experts, especially János Aczél and C. T. Ng, on issues of measurement in utility theory and psychophysics.

Although the National Medal of Science is given in the category of "Behavioral or Social Sciences," a perusal of winners from psychology reveals a heavy emphasis on mathematical theorists, including William Estes, Patrick Suppes, Roger Shepard, and Herbert Simon. Perhaps this is because the representatives of science and engineering who constitute the award committee see common ground with the methods of mathematical psychology, Luce conjectured. The mathematical approach, he suggested, points to one of the challenges facing psychological science today, namely, the lack of unified ideas and themes.

"Physicists agree on several - three or four - theoretical problems to attack; in psychology every theorist has a view." The lack of consensus, said Luce, may reflect the field's tendency to pursue research that rejects null hypotheses. He indicated that Psychology is perhaps one of a few sciences to focus mostly on the goal of rejecting something, rather than finding out what is approximately true. Mathematical psychology, on the other hand, tends to rely on model fitting and evaluation, an approach that intrinsically seeks to accept a null hypothesis that is framed by the model itself, that is, by its axioms and mechanisms. If the model is rejected, it's "back to the drawing board." Of course, issues of sample size and power are important in model testing and must be taken into account, but the goal of the model builder is to construct a "proper" model, not to reject an improper one. The broad impact of Luce's work attests to the value of the modeling approach. ■

SCIENCE BRIEFS

Automatic and Controlled Components of Implicit Stereotyping and Prejudice

by Jeff Sherman



Jeff Sherman received his PhD in 1994 from University of California, Santa Barbara. From 1994-2004 he held positions of Assistant and Associate Professor at Northwestern University. He is currently a Professor in the Department of Psychology at the University of California, Davis. His research focuses on the cognitive and motivational processes underlying stereotyping and prejudice. This research has been supported by the National Institute of Mental Health since 1996. He is a co-founder of the International Social Cognition Network (ISCON), and currently serves on the Steering Committee. He is Associate Editor of *Personality and Social Psychology Bulletin*. More information can be found on his website: <http://psychology.ucdavis.edu/faculty/pgms/page.cfm?PersonID=222>.

People may be unaware of important underlying beliefs and attitudes that affect their behavior. Even when they are aware of these beliefs and attitudes, they may be reluctant to report them veridically. This is especially true in the domain of intergroup perception, where people may face strong social sanctions for expressing negative attitudes about social groups. These so-called “willing and able” problems are significant impediments to studying stereotyping and prejudice.

In recent years, an increasingly popular response to these problems has been the use of implicit measures of stereotyping and prejudice (for a review, see Fazio & Olson, 2003). These measures aim to circumvent the “willing and able” obstacles by measuring attitudes and beliefs without participants’ awareness that they are being measured. Many proponents of these measures further argue that, even if made aware of the nature of the task, people are unable to control their responses. Thus, these measures are seen as reflecting the unintended, stimulus-driven, automatic activation of information in memory, whose expression largely cannot be altered or inhibited (e.g., Devine, 1989; Fazio, Jackson, Dunton, & Williams, 1995; Greenwald, McGhee, &

Schwartz, 1998). When these measures are taken in combination with explicit measures (e.g., questionnaires), researchers aim to compare and contrast automatic and controlled facets of stereotyping and prejudice.

Implicit Measures Are Not Process-Pure

However, there are two significant drawbacks to this approach. First, it confounds the processes of interest (automatic vs. controlled) with the particular measurement tasks. Because the tasks may differ in a number of ways beyond the extent to which they tap automatic versus controlled processes, there is a danger of misinterpreting dissociations in task performance. For example, many observed dissociations between implicit and explicit memory tasks may be reinterpreted as dissociations between tasks that tap perceptual versus conceptual processes (e.g., Roediger, 1990).

A second drawback is that no task is process pure. Undoubtedly, implicit measures of stereotyping and prejudice are less susceptible to the influence of intention and controlled processes than are explicit measures. Nevertheless, any behavioral task that requires an observable response (e.g., a button press) likely involves an ongoing inter-

play between simultaneously occurring automatic and controlled processes. As such, the behavioral response, in and of itself, is incapable of specifying the nature of the underlying processes that produced the response.

Consider the Stroop Task, for example (Stroop, 1935). A fully literate adult and a young child who knows colors but does not know how to read may make an equally small number of errors on the task. However, very different processes are at work for the adult and the child. On incompatible trials (e.g., the word “Blue” written in red ink), the adult must overcome a habit to read the word in order to name the color of the ink correctly. In contrast, the child has no habit to overcome; s/he simply responds to the color of the ink.

The same principle applies to implicit measures of stereotyping and prejudice, many of which have a Stroop-like structure of compatible (e.g., Black faces/negative words; White faces/positive words) and incompatible (e.g., Black faces/positive words; White faces/negative words) trials. The performance of two people who appear to have equally strong implicit biases

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may reflect very different underlying processes. Whereas one person may have strong implicit associations that are successfully overcome, the other may have weaker associations that are not overcome so well. Thus, behavioral outcomes on implicit measures of stereotyping and prejudice may not reflect differences in underlying attitudes, *per se*.

Separating Multiple Automatic and Controlled Components of Implicit Measures: The Quad Model

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In our research (Conrey, Sherman, Gawronski, Hugenberg, & Groom, *in press*), we have attempted to separate the automatic and controlled components of responses within individual implicit measures of stereotyping and prejudice. In taking this approach, we avoid the task/process confound that is problematic for many investigations of automatic and controlled processes. This approach also allows us to examine the simultaneous operation and interaction of multiple processes in implicit task performance.

We base our analysis on the Process Dissociation Procedure (PD) pioneered by Jacoby and his colleagues (e.g., Jacoby, 1991) to separate different processing components within a single task. However, our research extends the basic PD model in important ways. Whereas basic PD analyses produce a single estimate of automatic and controlled processing within a given task, we believe it is critical to distinguish between two distinct automatic processes and two distinct controlled processes. To assess each of these processes, we have proposed the Quadruple Process Model of implicit task performance (Conrey et al., *in press*).

The Quad Model (see Figure 1) is a multinomial model (see Batchelder & Riefer, 1999) designed to disentangle four qualitatively distinct processes that contribute to performance on implicit measures that rely on the logic of response compatibility (as illustrated above with Stroop Task). The four processes are: The automatic activation

of an association (Association Activation, AC), the ability to determine a correct response (Discriminability, D), the success at overcoming automatically activated associations (Overcoming Bias, OB), and the influence of a general response bias that might guide responses in the absence of other available guides to response (Guessing, G). Whereas AC and G are automatic processes (though G need not be), D and OB are controlled processes.

As an example of how the four processes operate, consider an evaluative priming task using pictures of Black and White faces as primes and positive and negative words as targets (e.g., Fazio et al., 1995). In such a task, the presentation of a Black face may automatically activate a negative evaluation (AC) that influences responses to a subsequently presented stimulus word. Depending on the trial type, this automatic tendency may be compatible or incompatible with the correct response determined through discrimination (D) of the target word. If the target word is negative, then the response tendency produced by the automatic evaluation and the response determined via discrimination are compatible. In this case, there is no conflict, and there is no need to overcome bias (OB) in order to produce the correct response. However, if the two response tendencies are incongruent (a Black prime followed by a positive target word), whether the automatic association or accurate discrimination drives the response is determined by whether the participant succeeds in overcoming his or her associations. If no association is activated and the correct response cannot be determined, participants must guess (G).

Though I have used an evaluative priming example, the logic is exactly the same with any implicit measure that compares compatible and incompatible trials. Indeed, to date, our results have come primarily from two different tasks, the Implicit Association Test (IAT: Greenwald et al., 1998) and the Weapons Identification Task (e.g., Payne, 2001).

Results

Analyses using the Quad Model are based on error rates occurring on different types of trials. The processing tree presented in Figure 1 (<http://www.apa.org/science/psa/sb-sherman.html#sherfigure1>) illustrates how the model predicts correct and incorrect responses on compatible and incompatible trials as a function of the operations of the four different processes. For example, there are three different ways to arrive at an incorrect response on incompatible trials. Each of these three combinations of processes represents a set of conditional probabilities by which the incorrect response is produced. These sets of conditional probabilities are used to generate model predictions that are compared to actual results to test for model fit, and are used to generate parameter estimates for each of the four processes (for details, see Conrey et al., *in press*).

At the most basic level, our data demonstrate that performance on both the IAT and the WIT is a function of all four of the proposed processes. If any process is removed from the model, the model fails. Other data showed that forcing participants to respond quickly on an IAT significantly reduced Discrimination and Overcoming Bias, but did not affect Activation and Guessing. This supports our view that D and OB are controlled processes, whereas AC and G are relatively automatic. In another study, we used the parameter estimates of the four processes to predict biases in response latencies on an IAT. The data showed that response time bias was positively correlated with estimates of the AC parameter, supporting the status of AC as a measure of automatic attitudes. In contrast, response time bias was negatively correlated with the OB parameter, confirming that success at overcoming automatic biases results in smaller estimates of implicit prejudice.

In another application of the model, we re-analyzed data collected by Lambert, Payne, Jacoby, Shaffer, Chasteen,

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and Khan (2003). In their study, they showed that an anticipated public context ironically increased the extent of implicit stereotyping. Based on a standard PD analysis, they concluded that this effect was due to diminished control in the public versus private context rather than to an increase in stereotype activation in the public context (which could be predicted by drive-based models of social facilitation; e.g., Zajonc, 1965). However, re-analysis with the Quad Model showed a very different result. When automatic and controlled processes were decomposed into four separate components, the results showed that, although Discrimination was diminished in the public condition, Overcoming Bias was enhanced in that condition. Thus, one type of controlled process was inhibited by an audience, and another was enhanced by the audience. Moreover, our analysis showed that the ACTivation parameter did increase in the public condition. In Lambert et al.'s analysis, this effect had been obscured by the simultaneous increase in Overcoming Bias, which was not measured. Together, these results show that an anticipated audience increases bias on an implicit measure because it inhibits people's ability to discriminate the correct response on the task, and because it increases activation of the dominant stereotypic response.

Conclusion

There are two main conclusions from our research. First, in research on automatic and controlled processes it is useful to move beyond task dissociation paradigms and use process dissociation procedures, instead. Second, it is important to move beyond the simple distinction between automatic and controlled processing, and begin to address important qualitative differences among automatic and controlled processes. As an example, our re-analysis of Lambert et al. (2003) showed that two different controlled processes were affected in opposite ways by the same manipulation. In each of our studies, by assessing all four of the processes in the Quad Model we were able to provide a more comprehensive, nuanced, and accurate description of implicit

task performance. To date, the Quad Model has been applied only in the domain of stereotyping and prejudice. However, it should apply more generally to any domain in which automatic impulses are either compatible or incompatible with controlled attempts to overcome those impulses, including research on phobias, addictions, aggression, persuasion, and more. We hope the model will prove to be a useful tool for researchers in many areas of psychology. ■

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National Science Foundation Announces Cyberinfrastructure Competition

For more information, visit:

Cyberinfrastructure TEAM (CI-TEAM)

http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf05460

March 2005 Announcements

2005 Academic Career Workshops

The Science Directorate's Academic Career Workshops have become an integral part of many scientific society meetings. We continue to receive rave review from attendees. The purpose of these workshops is to introduce graduate and postdoctoral students to the nuts and bolts of pursuing an academic career. Topics range from a description of variations in the academic culture across institutions to the pragmatics of the recruiting and hiring process.

See the website for the 2005 Academic Career Workshop schedule. If you are interested in additional information about the workshops, such as co-hosting or attending one, please contact Deborah McCall by phone at 202-218-3590 or via email at dmccall@apa.org.

8 Conference on the Contemporary Applications of Psychological Testing

The Psychology Department at the Massachusetts Mental Health Center is presenting its 9th Annual Conference on the Contemporary Applications of Psychological Testing, which will feature John Exner and Jim Butcher, reflecting on their history and the future of psychological testing. The conference will be a wonderful opportunity to see Exner and Butcher discuss the development and current applications of the Rorschach Comprehensive system and the MMPI revision. Exner and Butcher will conduct case conferences, and a mock trial will demonstrate how to present and defend psychological testing in court. The conference will be preceded by a pre-conference institute, "Recent Developments in Assessing Children and Adolescents with Neurodevelopmental and Acquired Disorders," which will feature Edith Kaplan and Nancy Hebben, among other speakers.

The preconference institute will be held on Thursday, March 31, 2005, and the conference will be held on April 1 and 2, in Boston. Please contact (617) 998-5028 for more information. ■

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