

# Center for Scientific Review Advisory Council

## *Toward Assessment of Peer Review Group Outcomes*

December 16<sup>th</sup>, 2013

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Department of Health and Human Services



# Peer Review is Fundamental to the NIH Mission

- The NIH two-tier peer review system is the foundation on which the agency's funding of extramural research is based
- While this system is highly regarded throughout the world, it is vital that NIH continue to innovate and optimize the process by which grant applications are reviewed

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# Continuous Review of Peer Review



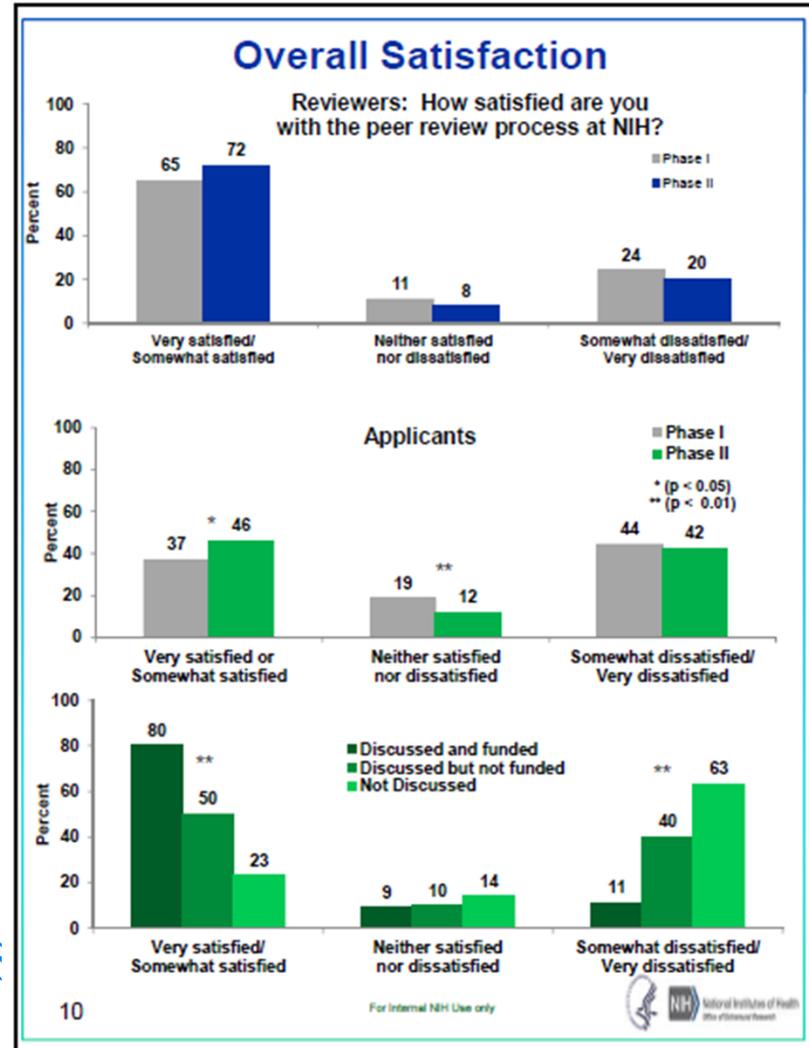
## Enhancing Peer Review Survey Results Report



Published May 2013



[http://enhancing-peer-review.nih.gov/docs/Enhancing\\_Peer\\_Review\\_Report\\_2012.pdf](http://enhancing-peer-review.nih.gov/docs/Enhancing_Peer_Review_Report_2012.pdf)



# Continuous Review of Peer Review

## ACD Working Group on Diversity in the Biomedical Research Workforce

NIH should establish a WG of the ACD comprised of experts in behavioral and social sciences and studies of diversity with a special focus on determining and combating real or perceived biases in the NIH peer review system (Recommendation #9)

NIH should first, pilot different forms of validated implicit bias/diversity awareness training for NIH scientific review officers and program officers to determine the most efficacious approaches. Once the best training approaches have been identified with NIH staff, pilot these programs with members of study sections to ascertain if their value is sustained. If they are, provide to all study section members (Recommendation #10)

[http://acd.od.nih.gov/06142012\\_DBR\\_ExecSummary.pdf](http://acd.od.nih.gov/06142012_DBR_ExecSummary.pdf)



# No Shortage of Opinions

## Restructuring the NIH and its grant programs to ensure stable careers in science

# SCOPE

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NIH, RESEARCH

NIH funding  
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Krista Conger

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Editorial

### NIH Grant Fun

What's New?

UNC Health Research Institute

I admit that I had to be  
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#### The Problem and its O

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### Modelling the effects of subjective and objective decision making in scientific peer review

In-Deok Park, Mike W. Peasey & Marcus R. Munafò

Affiliations | Contributions | Corresponding author

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The objective of science is to advance knowledge, primarily in two interlinked ways: circulating ideas, and defending or criticizing the ideas of others. Peer review acts as the gatekeeper to these mechanisms. Given the increasing concern surrounding the reproducibility of much published research<sup>1</sup>, it is critical to understand whether peer review is intrinsically susceptible to failure, or whether other extrinsic factors are responsible that distort scientists' decisions. Here we show that even when scientists are motivated to promote the truth, their behaviour may be influenced, and even dominated, by information gleaned from their peers' behaviour, rather than by their personal dispositions. This phenomenon, known as herding, subjects the scientific community to an inherent risk of converging on an incorrect answer and raises the possibility that, under certain conditions, science may not be self-correcting. We further demonstrate that exercising some subjectivity in reviewer decisions, which serves to curb the herding process, can be beneficial for the scientific community in processing available information to estimate truth more accurately. By examining the impact of different models of reviewer decisions on the dynamic process of publication, and thereby on eventual aggregation of knowledge, we provide a new perspective on the ongoing discussion of how the peer review process may be improved.

JANUARY 28, 2013

ce, but an incredibly difficult time to be a scientist.

going on. Everywhere I go – my lab, seminar visits, biologists young and old are bursting with ideas, eager to see ways to observe, manipulate and understand the

energy is, it is accompanied by an equally palpable sense of worst periods of scientific funding I – and my more bet. People aren't just worried about whether their next worried about whether a career in academic or public Clancy's excellent post on the subject).

consensus among the leaders of our community, such as "Congress to give us (them) more money. I get emails or e to contact my senators and representatives to urge st. While I am, in the abstract, in favor of more money press and Francis Collins came to me asking for more olster our support for scientific research, but we're not e until you get your s\*\*t together and stop using the 'bad decisions and bad policies."

g with the NIH today, I could write a book. It's become scy that's lost sight of its central missions. If it were up NIH intramural research into a stand alone entity and r Basic Biomedical Research charged allocating funds

re again, and when NIH funding levels

come to the fore, inevitably the topic of the peer review of NIH grants comes to the fore with it.

The system by which NIH grants are reviewed involves what is known as a study section, which

1/60

# Additional Challenges We Face

- Does our peer review system optimally inform decision making to support the most important science? Keep in mind two distinct issues:
  - Do we select the best applications across NIH?
    - Does the practice of normalizing percentiles adversely bias our decision making? (i.e., are all study sections the same)?
    - Does our current IRG structure perpetuate fields of science beyond their “prime” and/or inhibit the emergence of new fields of science?
  - Even if we can agree on which applications are “best”, do the best applications yield the most valuable science?

# Issues to Consider

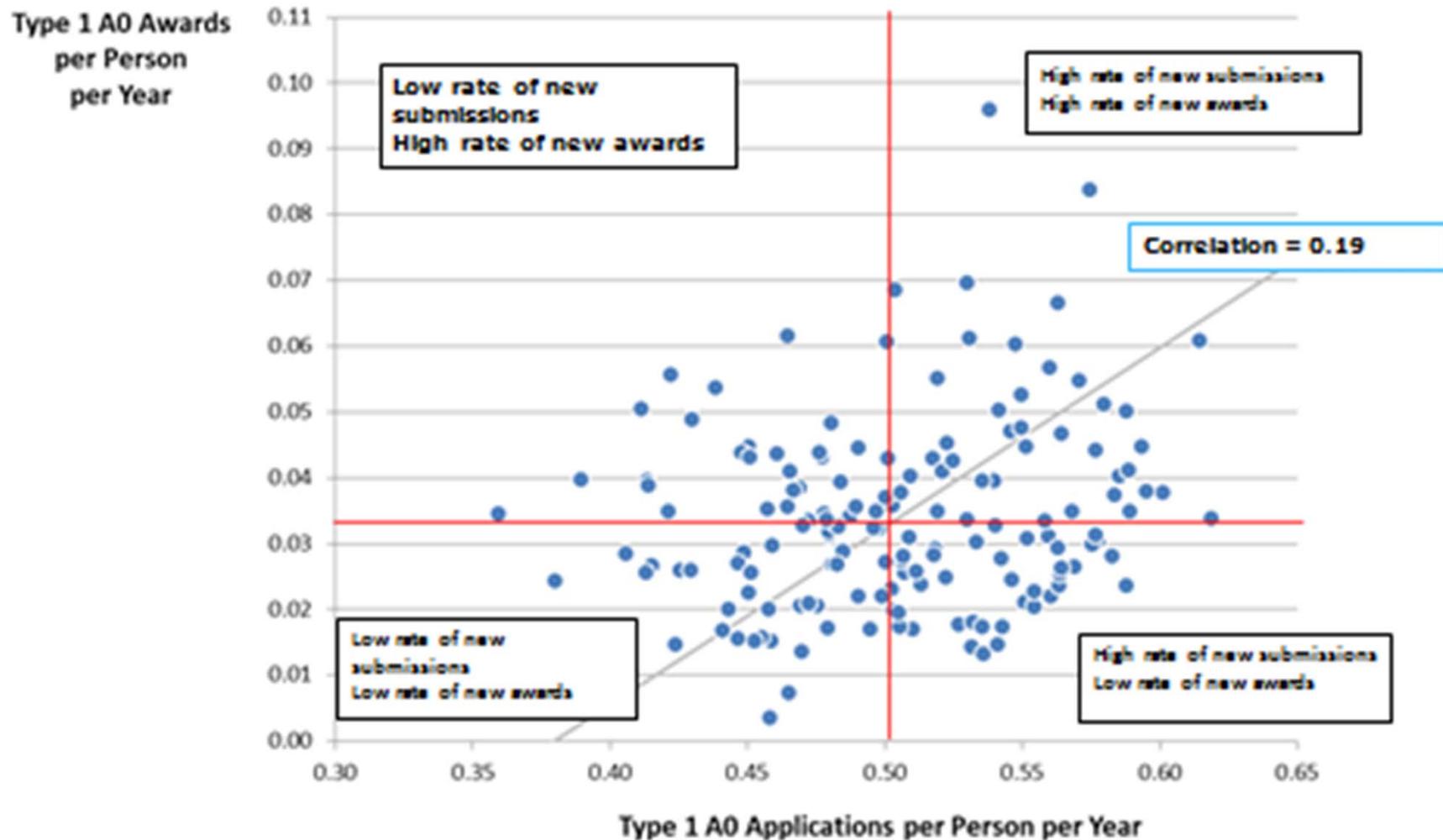
- How could NIH systematically evaluate the characteristics of study section “performance” to ensure that resources are directed towards the most compelling opportunities?
- How could NIH more proactively identify emergent fields of science to better couple the “state” of scientific fields to study section organization ensuring a dynamic system that is responsive to changes in scientific trends?

# Possible Quantitative Approaches Being Explored

- Analysis of study section “inputs” – OER
  - Examine the number of new applications, the number of new awards, and the relationship between the two for different study sections, while controlling for their different sizes

# Application and Award Rates

## Unsolicited Type 1 R01s (A0s)

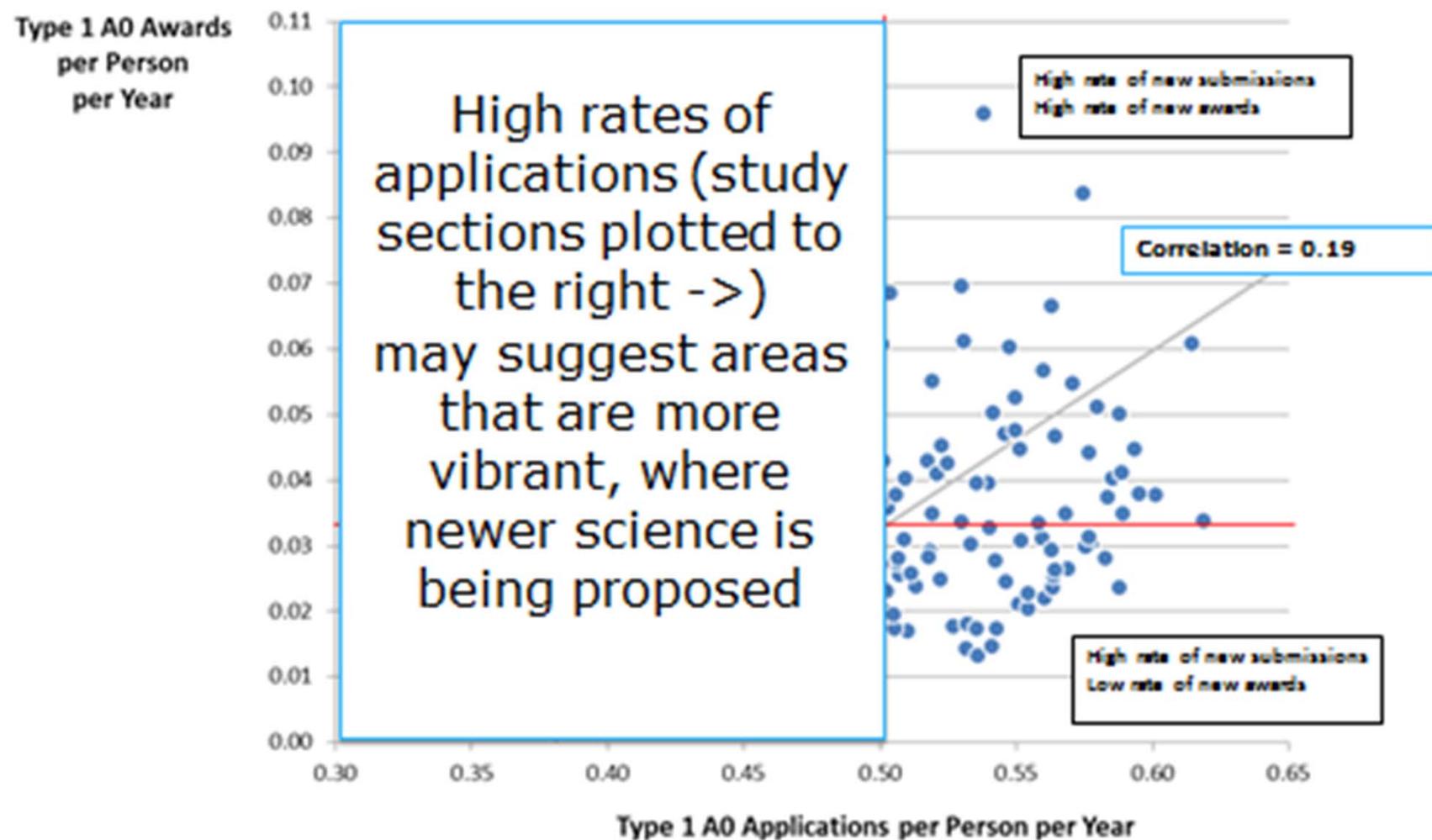


Study sections distributed by number of new (type 1) unsolicited R01 applications received (on the x axis) and the number awarded (on the y axis), expressed as rates per person-year (e.g., 3 applicants applying over 2 years is 6 person-years)

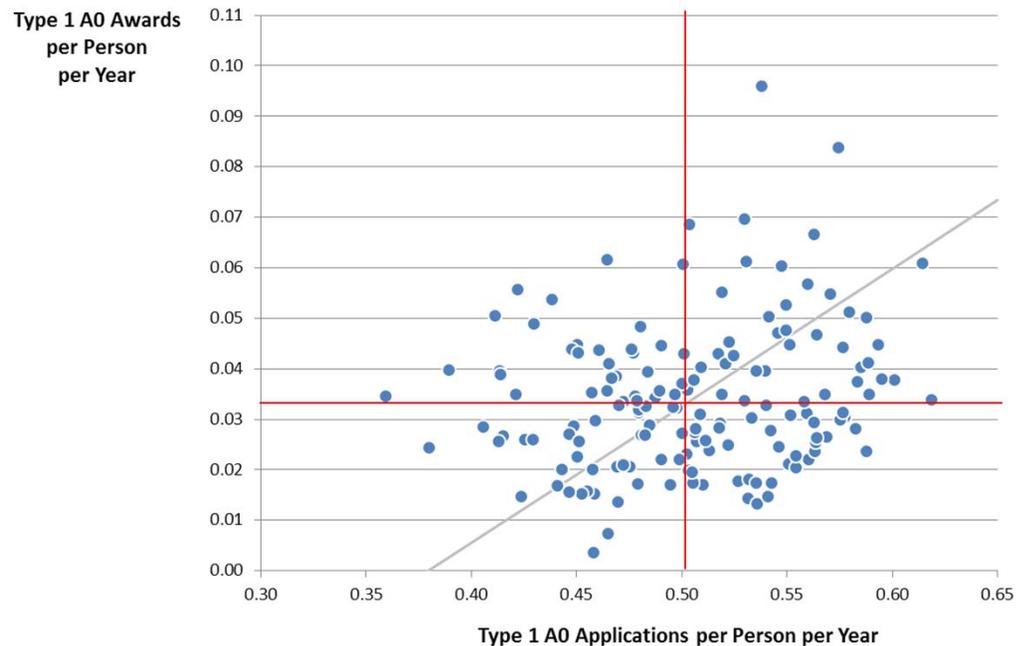
Chart 362-15-2  
Produced by OSAH

# Application and Award Rates

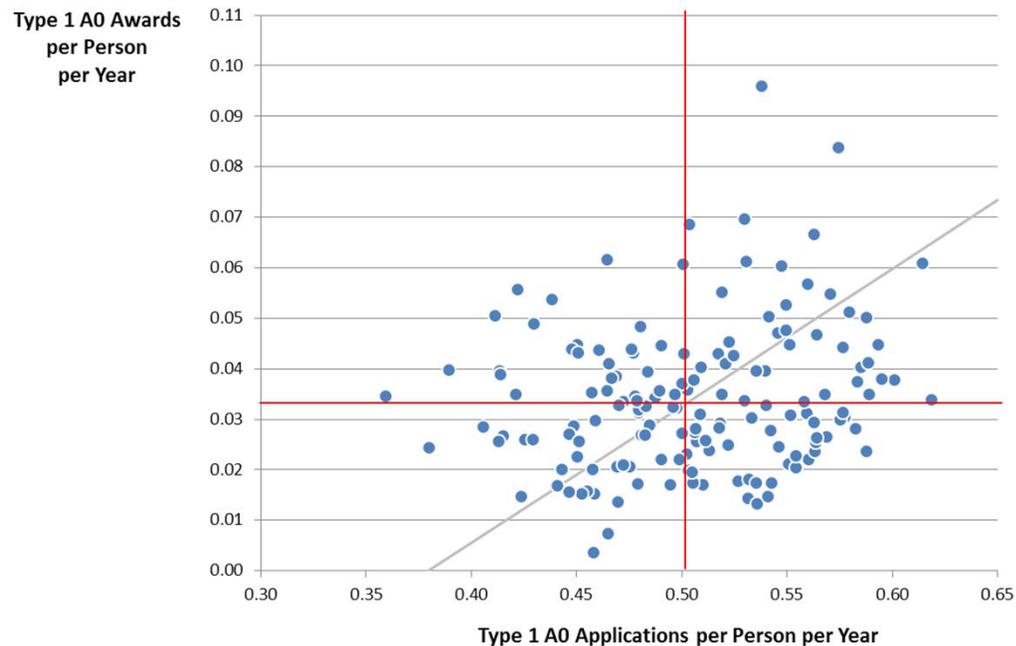
## Unsolicited Type 1 R01s (A0s)







- To the extent that percentile scores are used to make funding decisions, there should be a high correlation between application and funding rates. Major differences in the two rates (i.e., study sections deviating from the diagonal) might reflect:
  - A relatively low award rate relative to other study sections with similar application rates might indicate a study section that is giving poorer scores to A0 type 1s (e.g., perhaps creating a “queue” or favoring more established investigators). On the other hand, relatively high award rates might indicate a study section’s support for new PIs, or perhaps openness to new ideas.
  - If not simply a scoring bias, a relatively low award rate might indicate areas in which the new science being proposed is simply not as meritorious as the ongoing work (i.e., type 2 applications). Relatively high award rates might indicate areas in which reviewers are particularly enthusiastic about the new science being proposed.

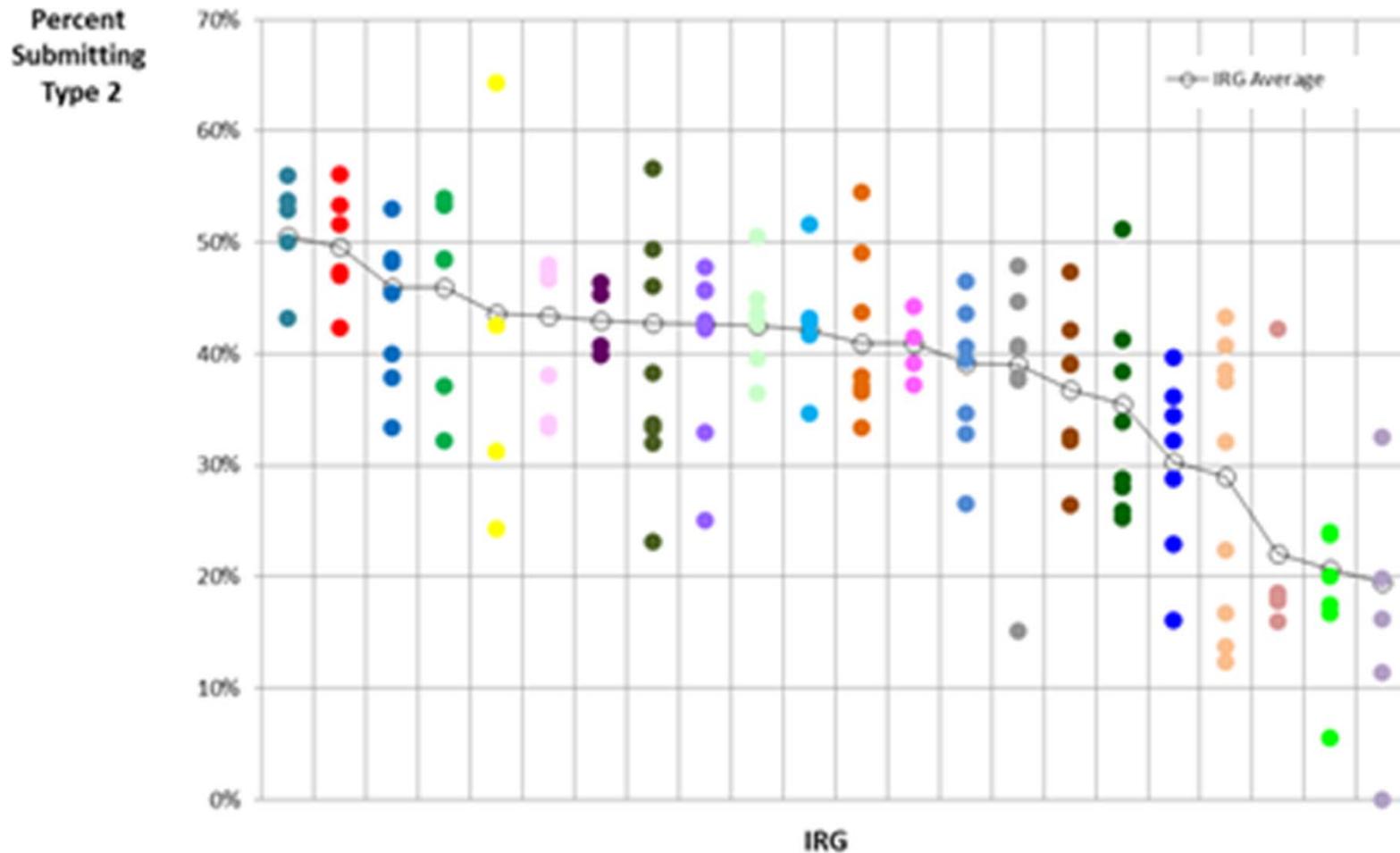


- To the extent that percentile scores are used to make funding decisions, there should be a high correlation between application and funding rates. Major differences in the two rates (i.e., study sections deviating from the diagonal) might reflect (cont.):
  - If award rates are not accounted for by percentile scores, relatively high (or low) award rates among study sections having comparable application rates might indicate areas that program staff perceive as being of particular interest (or already saturated).
  - A study section whose applications are assigned disproportionately to an IC with a low payline may have an unusually low award rate, relative to its application rate.

# Possible Quantitative Approaches Being Explored

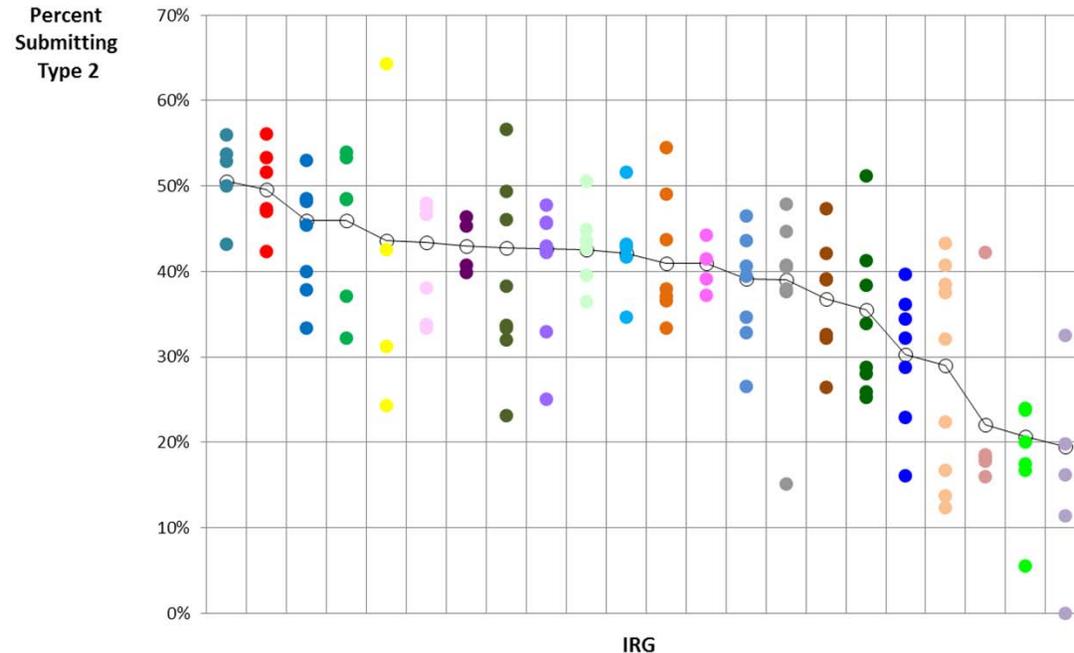
- Analysis of study section “inputs” - OER
  - Examine the number of new applications, the number of new awards, and the relationship between the two for different study sections, while controlling for their different sizes
  - Percent of Awardees who submit competing renewals by IRG

## Percent of Awardees Who Submit Competing Renewal (FY 2004-2007 Awardees)



Study sections vary in the probability that funded investigators will successfully apply for and receive a renewal

# Percent of Awardees Who Submit Competing Renewal (FY 2004-2007 Awardees)



Higher levels of renewal might indicate:

- Areas in which ongoing work is showing promise,
- A study section favoring established investigators, possibly less open to new ideas,
- An area of science which requires long-term continuous effort (e.g., as opposed to, say, clinical studies with limited time horizons)

Lower renewal rates might indicate areas in which funded research has not generated results worth pursuing by the investigator.

# Possible Quantitative Approaches Being Explored

- Analysis of study section “inputs” - OER
- Tracking indicators of emergent fields
  - “Word bursts” in literature, applications – which precede widespread adoption could indicate a new research area
  - The appearance of new investigators in applications to the study section
  - Citation analysis of applications –emerging areas tend to cite interdisciplinary references
  - “Altmetrics”

# “Altmetrics”



1. Add bookmarklet to your bookmarks toolbar
2. Visit any paper
3. Get article level metrics with a single click



## THE CHRONICLE OF HIGHER EDUCATION

JUNE 4, 2013

Steven B. Roberts's 103-page tenure package features the usual long-as-your-arm list of peer-reviewed publications. But Mr. Roberts, an assistant professor at the University of Washington who studies the effects of environmental change on shellfish, chose to add something less typical to his dossier: evidence of his research's impact online.

He listed how many people viewed his laboratory's blog posts, tweeted about his research group's findings, viewed his data sets on a site called Figshare, downloaded slides of his presentations from SlideShare, and otherwise talked about his lab's work on social-media platforms. In his bibliography, whenever he had the data, he detailed not only how many citations each paper received but how many times it had been downloaded or viewed online. The strategy was part of "an attempt to quantify online science outreach," he explained in his promotion package.

*By Jennifer Howard*

<http://www.altmetric.com>



# Possible Quantitative Approaches Being Explored

- Analysis of study section “inputs” - OER
- Tracking indicators of emergent fields
- Analysis of the study section “outputs” - DPCPSI
  - In theory, the bibliometric history of publications (or patents) attributed to funded applications that were reviewed by a study section/IRG could help define the “quality” of the study section/IRG

# Possible Quantitative Approaches Being Explored

- Analysis of study section “inputs” - OER
- Tracking indicators of emergent fields
- Analysis of the study section “outputs” - DPCPSI
  - In theory, the bibliometric history of publications (or patents) attributed to funded applications that were reviewed by a study section/IRG could help define the “quality” of the study section/IRG
  - The conundrum is that no accepted surrogate metric exists to “predict” the value of a publication

# The “evils” of citation analysis

theguardian

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## How journals like Nature, Cell and Science are damaging science

The incentives offered by top journals distort science, just as big bonuses distort banking



**Randy Schekman**

The Guardian, Monday 9 December 2013 14.30 EST

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# Possible Quantitative Approaches Being Explored

- Analysis of study section “inputs” - OER
- Tracking indicators of emergent fields
- Analysis of the study section “outputs” – DPCPSI (cont.)
  - However, if we could objectively normalize citations or rate of citations for different scientific fields, this might be a truer reflection of a publication’s value

# Welcome to a Lab Meeting



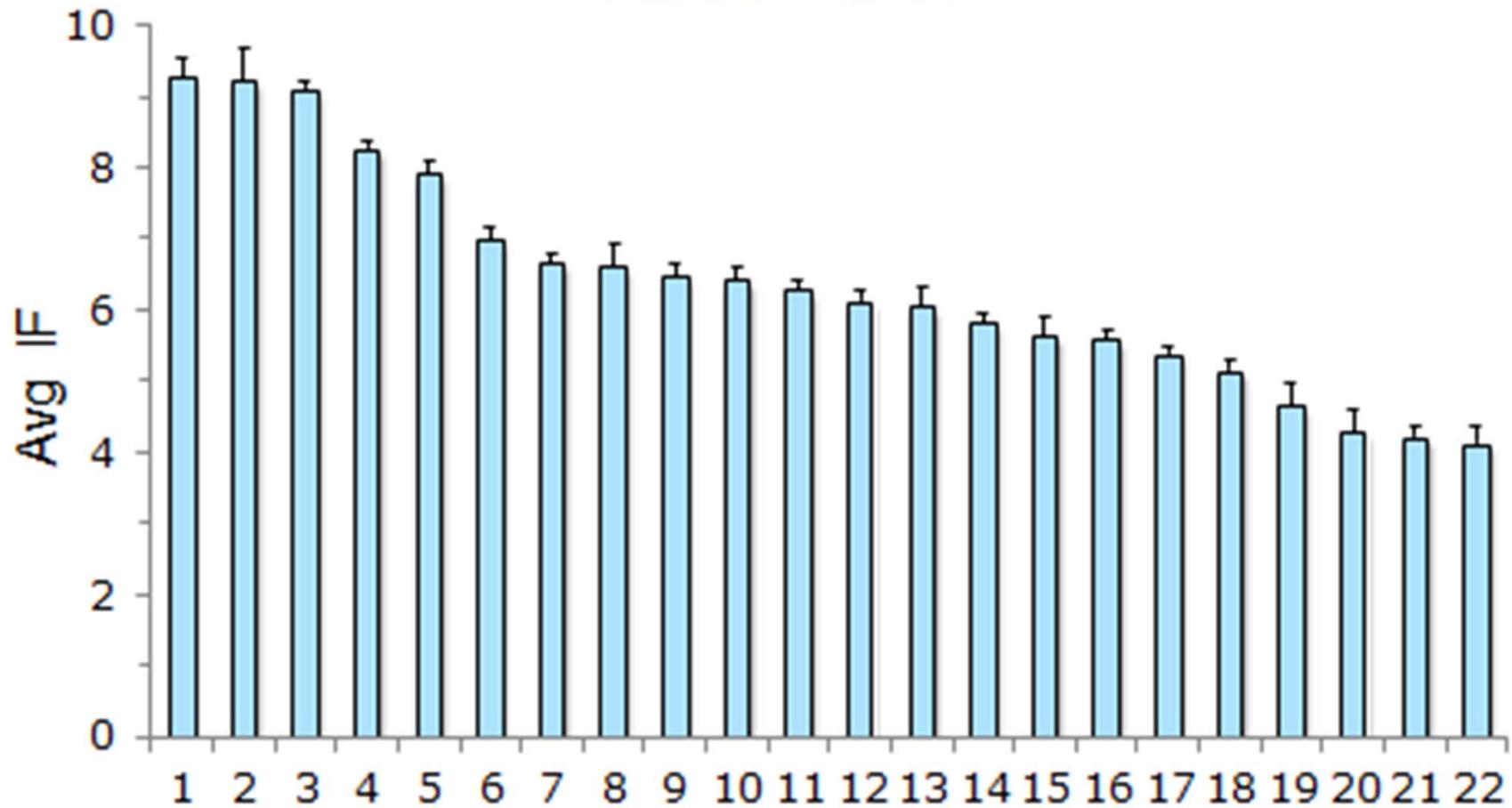
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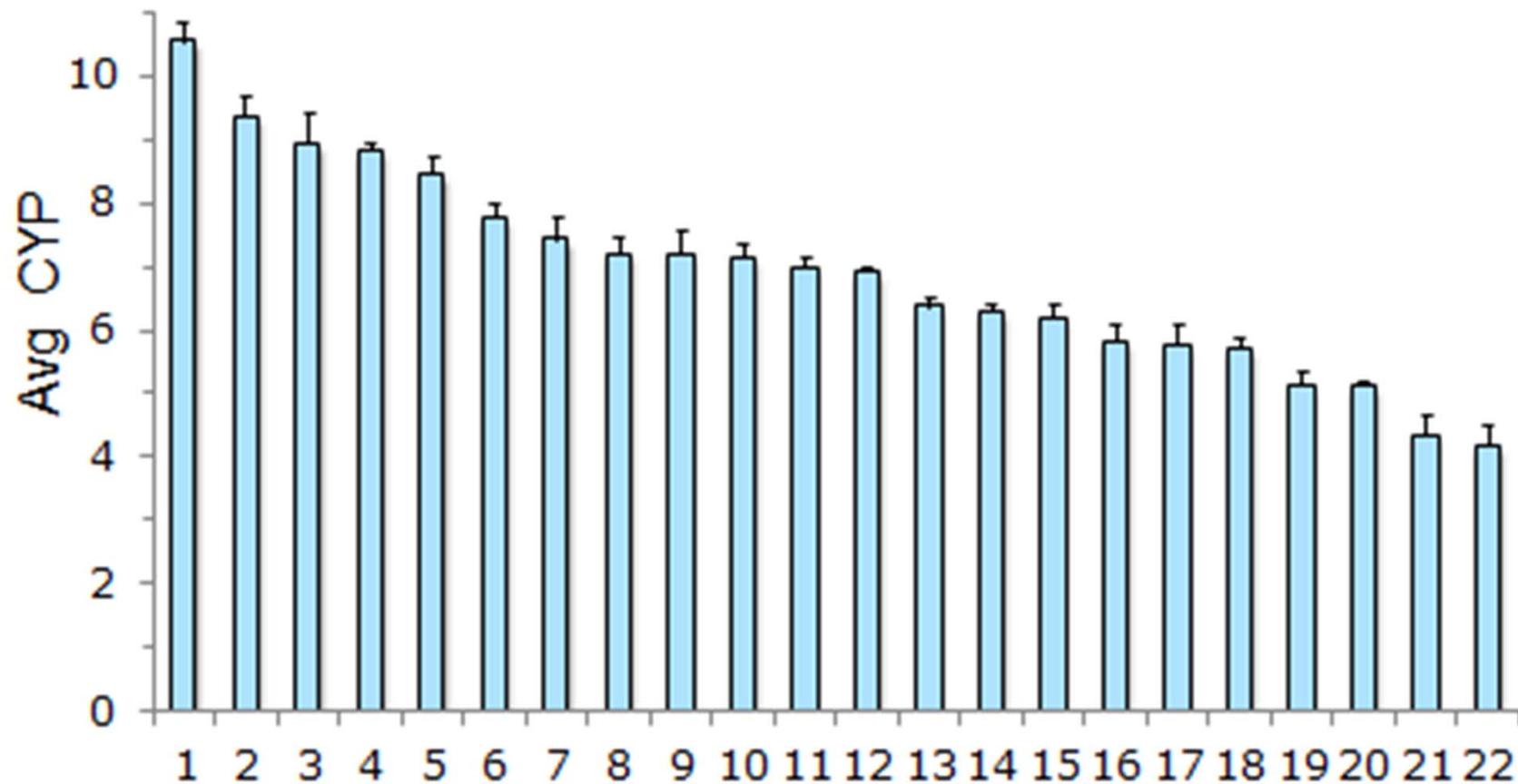
# Relative Citation Rate (RCR)

- The RCR compares CRs of publications derived from grants reviewed by a study section or IRG with the average citation rates of all publications that appear in the cognate journal.
- Publications (150,174), appearing in an average of 2128 journals each year) associated with funded 53,544 R01 projects from 2007-2011 were analyzed.

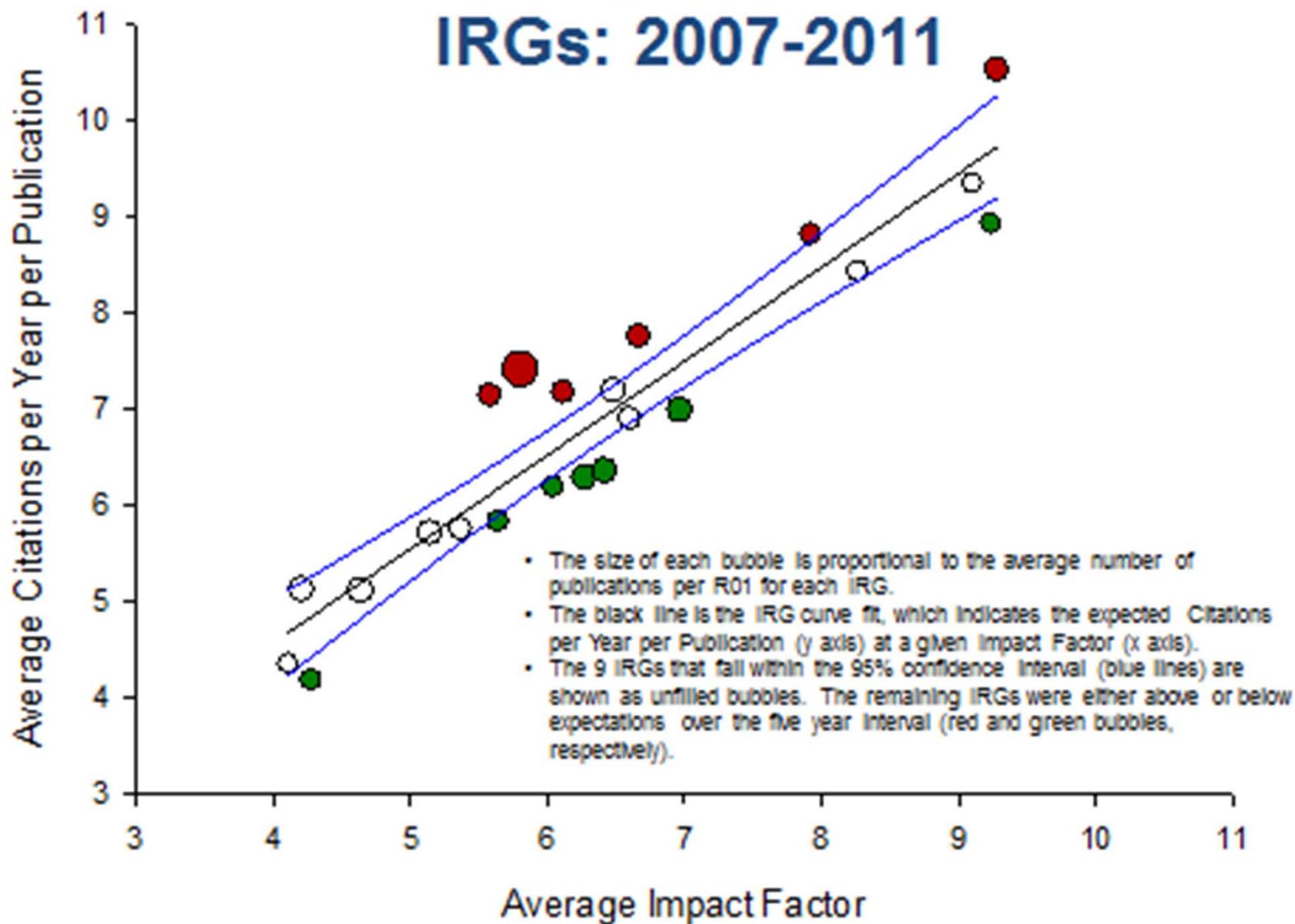
# IRG Average Impact Factor (IF) 2007-2011



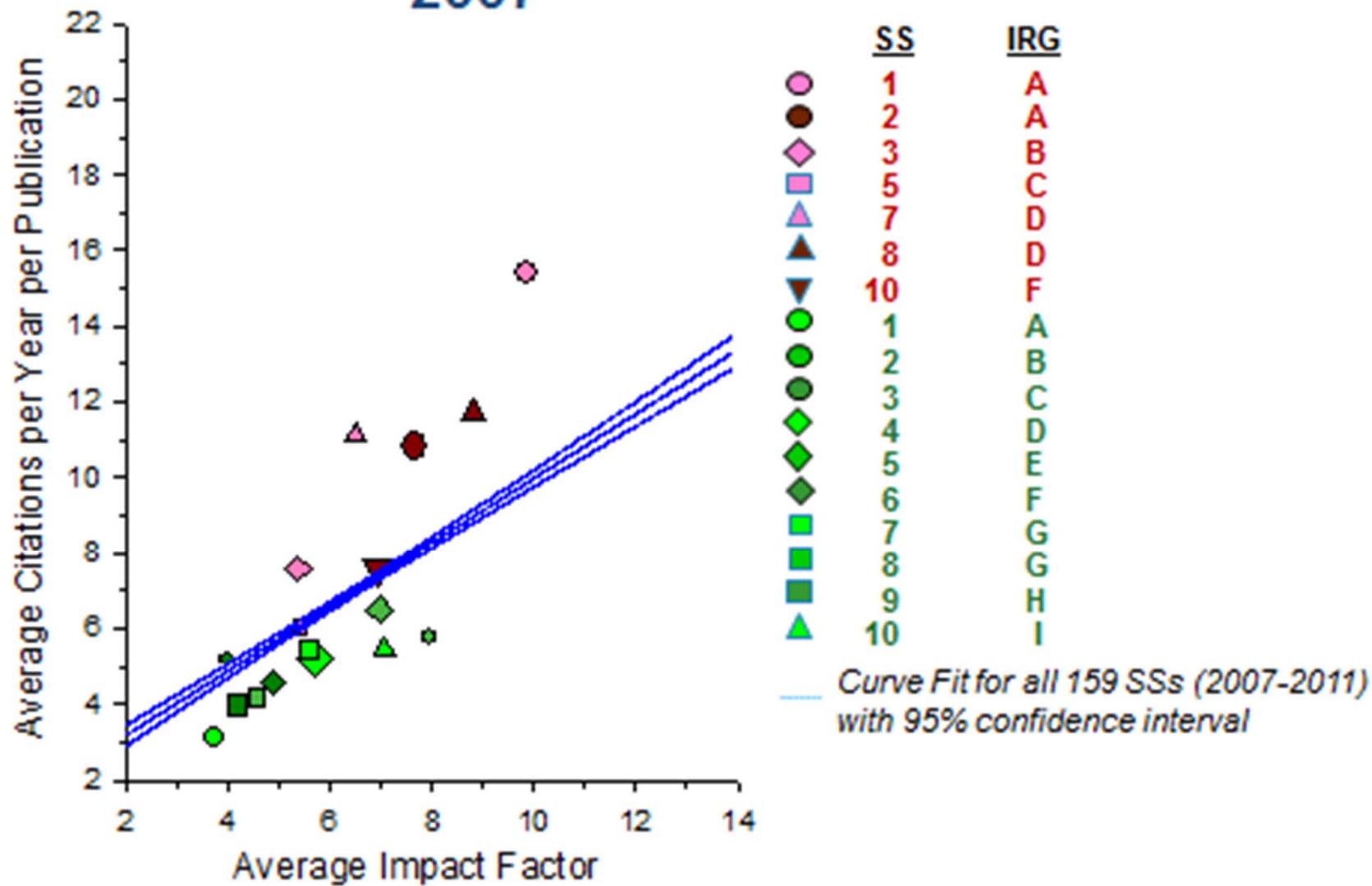
# IRG Average Citations/Year/Publication (CYP) 2007-2011



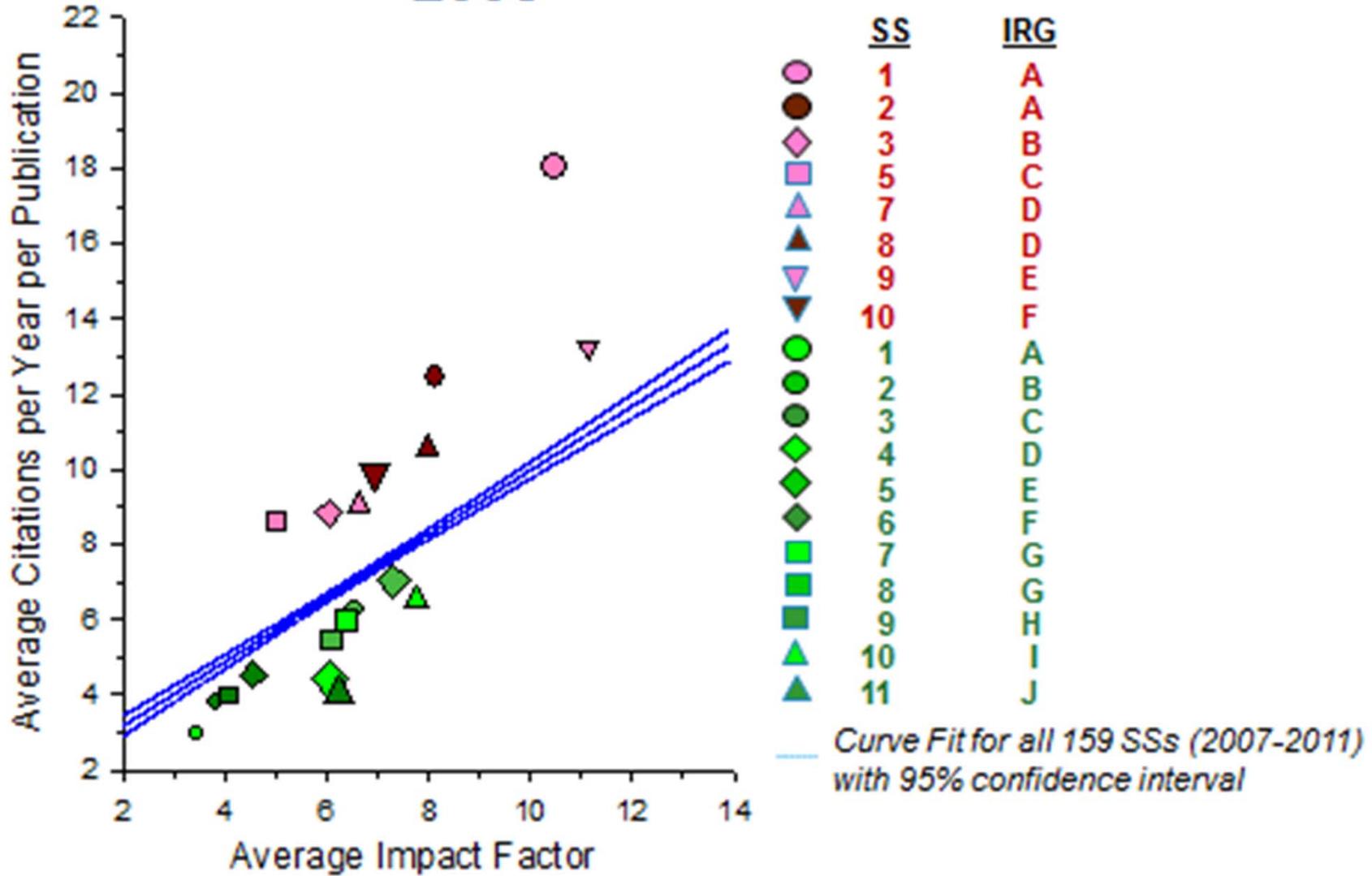
# Observed vs Expected Citation Rate IRGs: 2007-2011



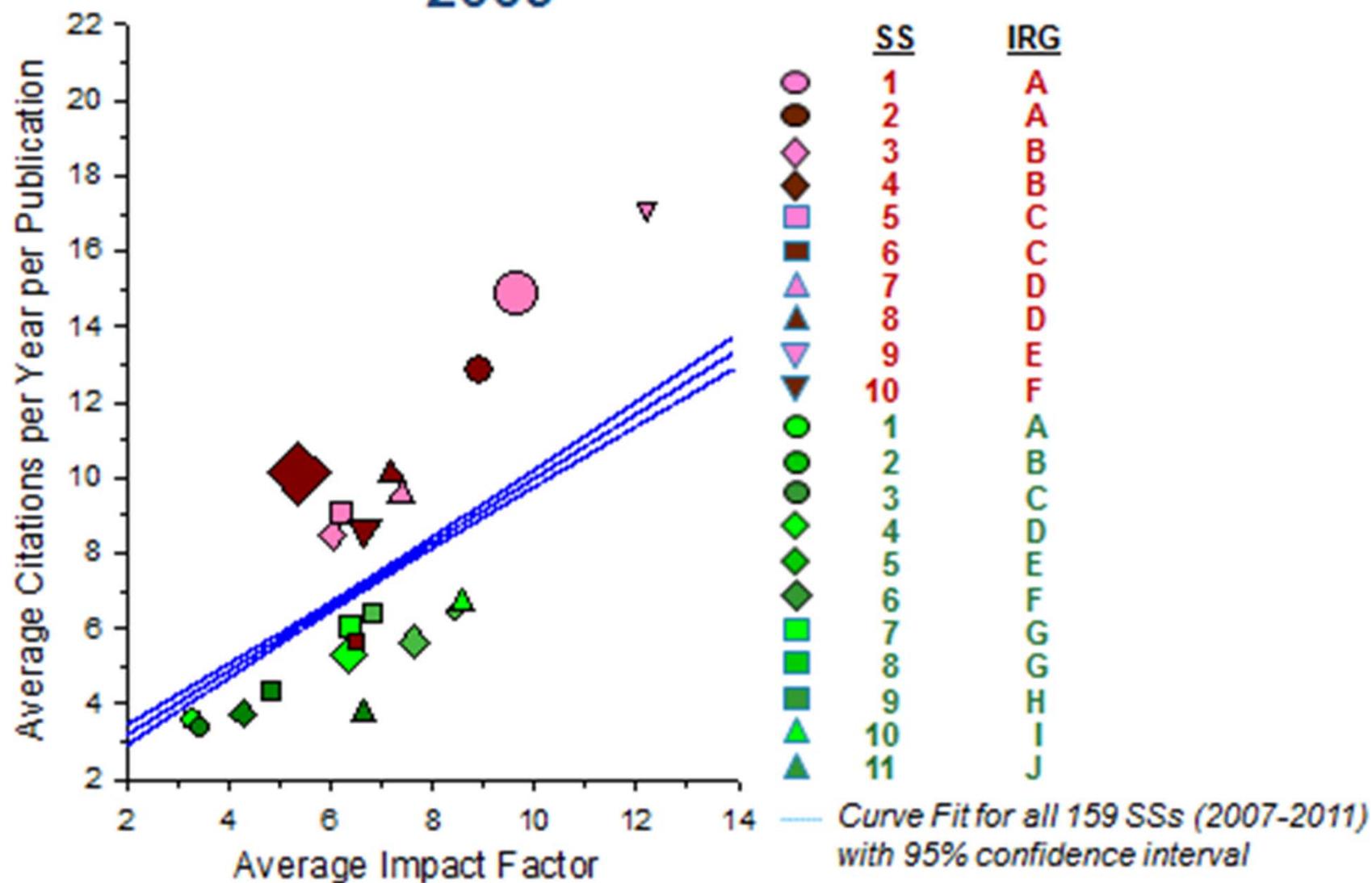
# “Hot” and “Cold” Study Sections 2007



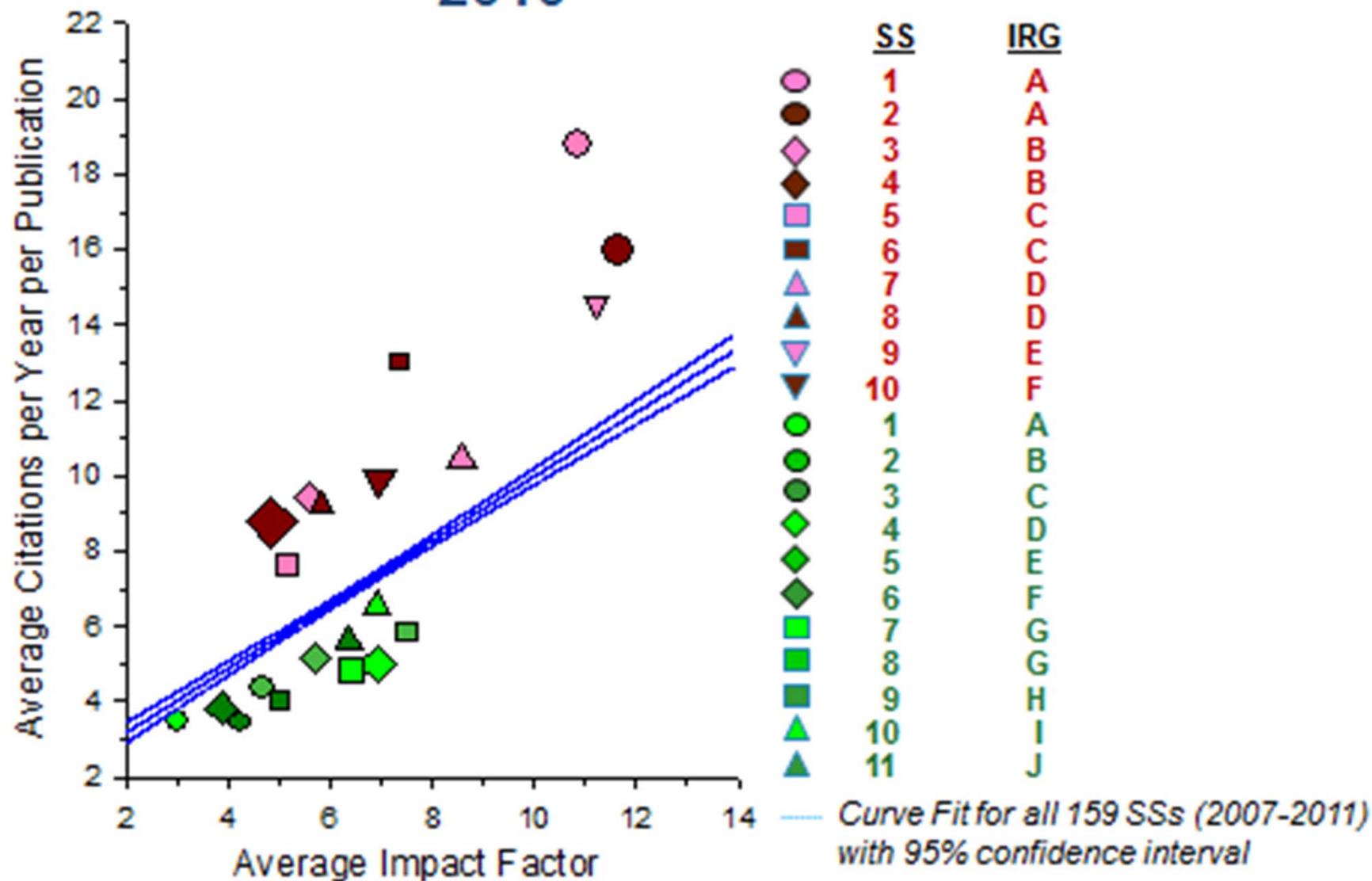
# “Hot” and “Cold” Study Sections 2008



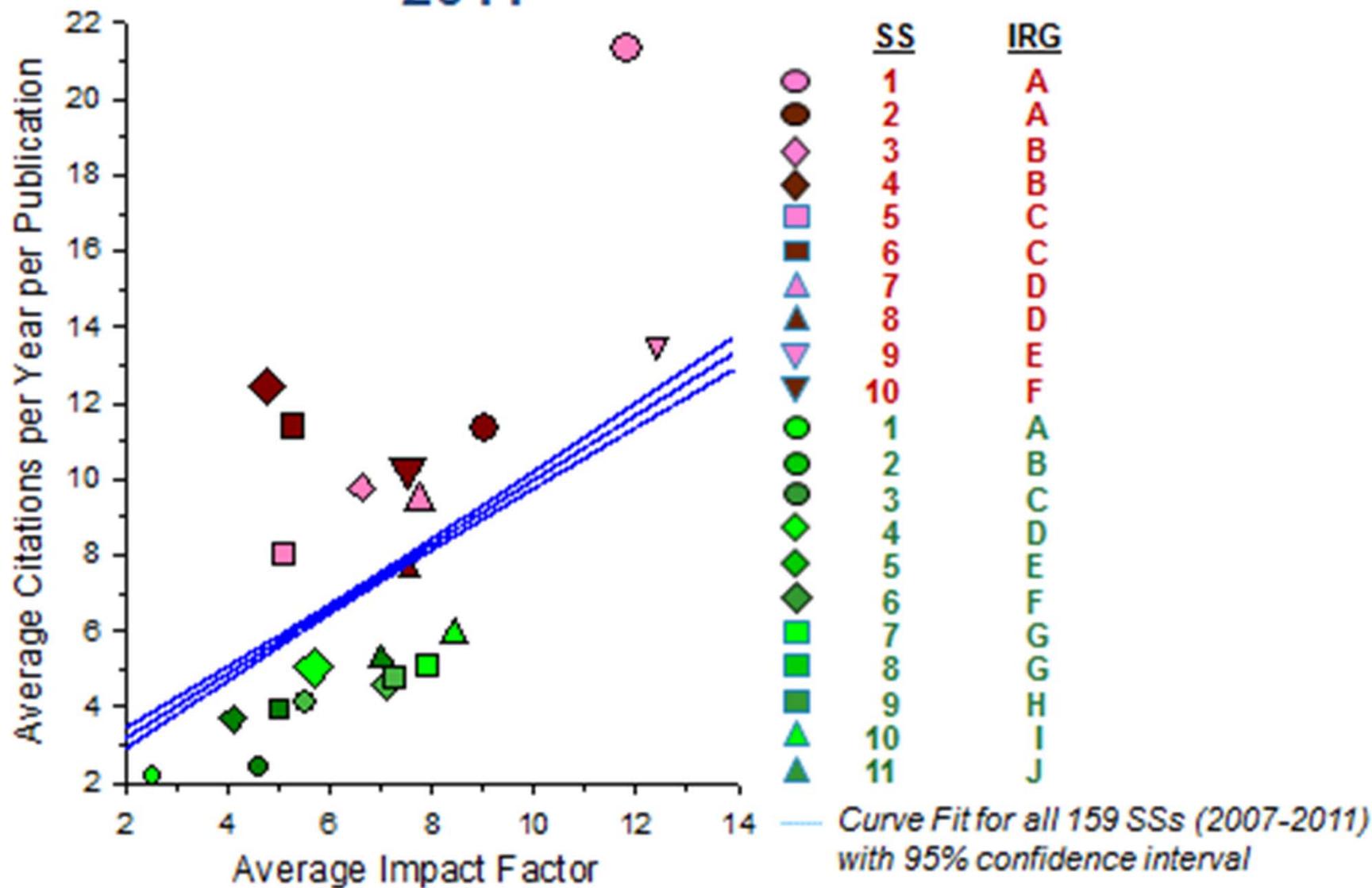
# “Hot” and “Cold” Study Sections 2009



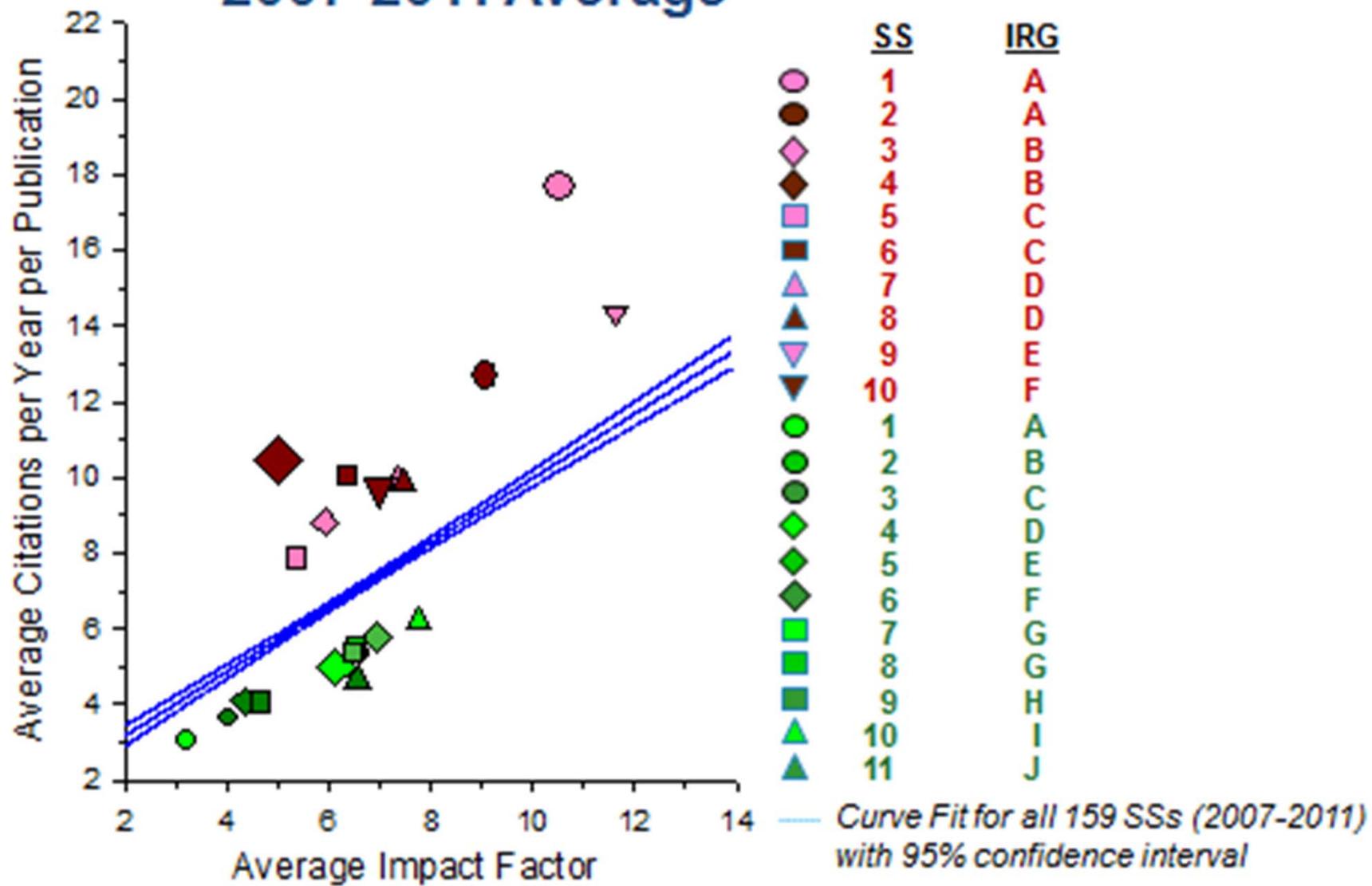
# “Hot” and “Cold” Study Sections 2010



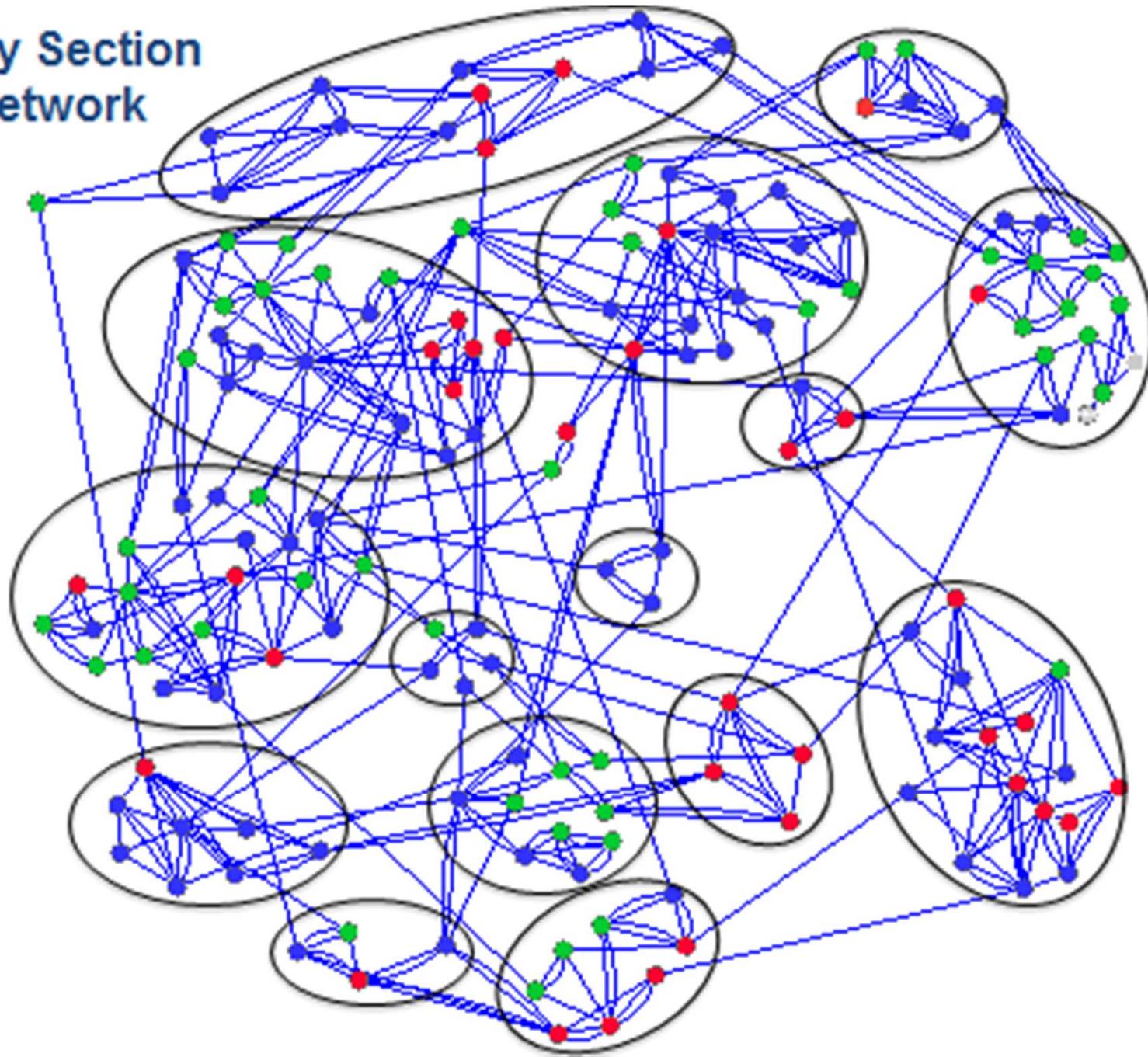
# “Hot” and “Cold” Study Sections 2011



# “Hot” and “Cold” Study Sections 2007-2011 Average



# Study Section Network



# Possible Quantitative Approaches Being Explored

- Analysis of study section “inputs”
- Tracking indicators of emergent fields
- Analysis of the study section “outputs”
- Analysis of study section “uniqueness”
  - Scientific similarity among applications reviewed by a study section
    - Fingerprints of applications
    - Reviewer citation patterns
    - Assignments and assignment requests
    - Applicant publications

# Limitations of quantitative approaches

- Analysis of review group outputs may be suggestive but clearly this will not provide sufficient insight into the nature and quality of the science we are supporting, nor will it be sufficient to identify emergent fields.
- Any quantitative analyses must be supplemented with expert qualitative input.

# Thanks To:

- Jim Anderson (DPCPSI)
- George Chacko (CSR)
- Della Hann (OER)
- Richard Nakamura (CSR)
- Jim Onken (OER)
- Sally Rockey (OER)
- George Santangelo (OSB, DPCPSI)



# NIH...

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## Turning Discovery Into Health

