Pre-Registration: What & Why

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What is Pre-Registration?

commitment to

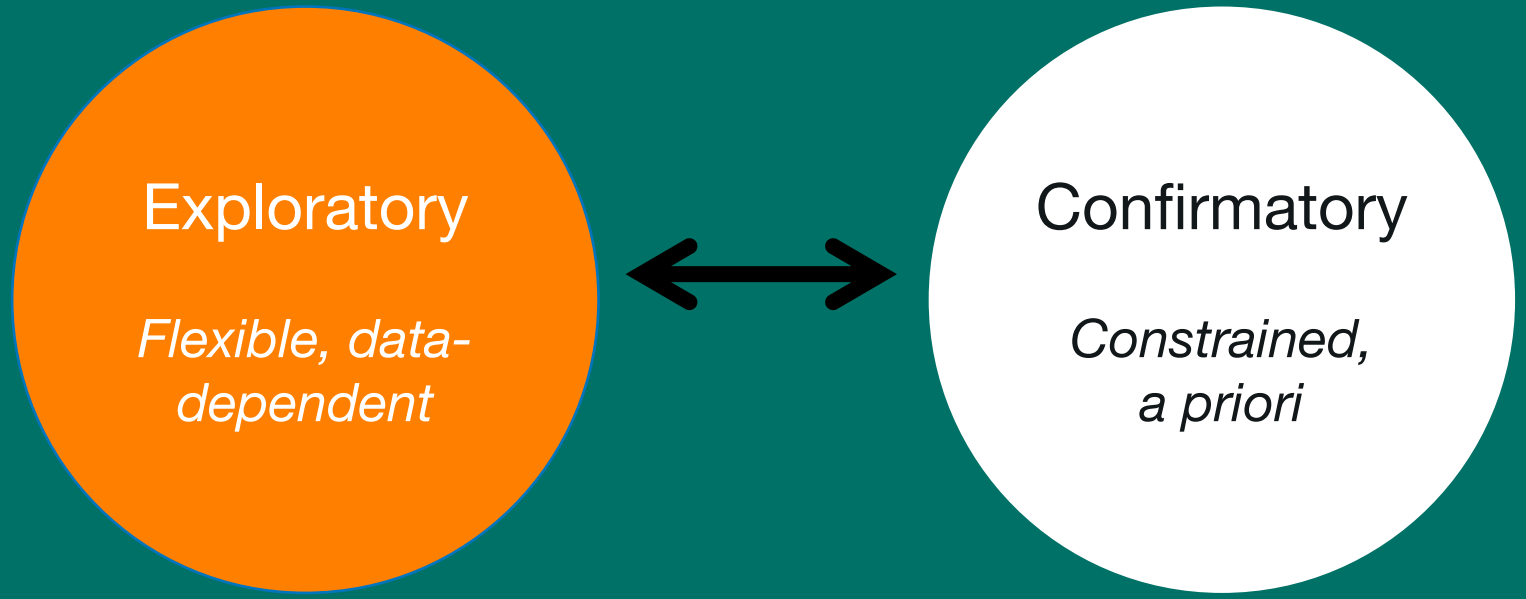
- study design (and/or)

- data analysis plan (and/or)

- study hypotheses

prior to commencing the study

Pre-Registration



See De Groot (1956): http://www.ejwagenmakers.com/inpress/DeGroot1956_TA.pdf

van't Veer & Giner-Sorolla (2016): https://psyarxiv.com/4frms/

Key Features: Pre-Registration

Time stamped

Read only

Before the study

In a repository

Why Pre-Register? Distinct Goals

constrain flexibility, avoid overfitting

Increase transparency, rigor

falsify, test theories

Decisional Flexibility at Every Stage

Methods

- Stopping rule
- Power planning
- Unique scoring

Analysis

- Subgroups
- Outliers
- Choice of test
- Data cleaning

Reporting

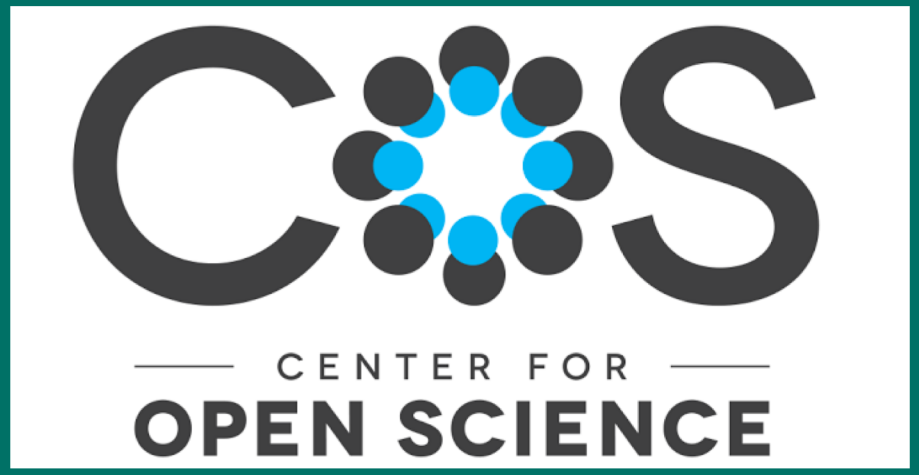
- Focus on $p < .05$
- Selective omission
- Outcome switching

One Step at a Time

New Habits Need to Form

Options for Pre-Registration

1. An internal/non-public system
2. Simple templates (aspredicted.org)
3. Full fledged registries



Open Science Framework:

https://cos.io/prereg/

Economics:

https://www.socialscienceregistry.org/

Poli Sci:

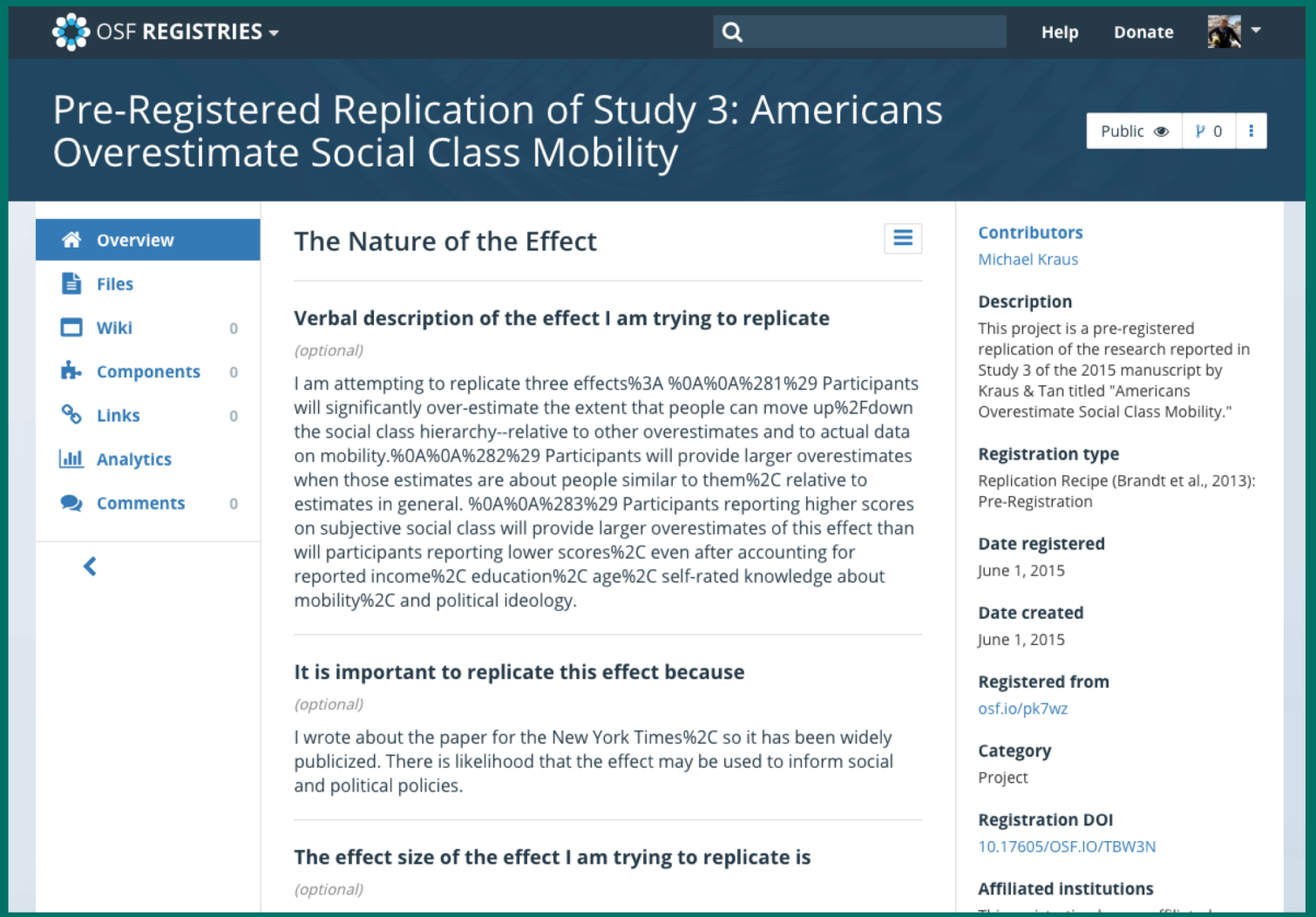
http://egap.org/content/registration

Biomedicine:

https://www.who.int/ictrp/network/en/

https://clinicaltrials.gov/

The Open Science Framework



Tips for Successful Pre-Registration

1. Use a template
2. Peer review pre-study
3. Plan for power
4. Be specific
5. Know how you'll draw a conclusion
6. Peer review post-study

Tools for Pre-Registration

Templates

- https://osf.io/zab38/wiki/home/

Power Analysis

- *pwr* package in R: https://cran.r-project.org/web/packages/pwr/vignettes/pwr-vignette.html
- Power simulation: Lane & Hennes (2018) https://doi.org/10.1177/0265407517710342

Basic Pre-Reg Questions

1. Main research question
2. Key variables & their measurement
3. Hypotheses**
4. Conditions & randomization**
5. Sample size & stopping rule
6. Study inclusion criteria
7. Data exclusion criteria
8. Positive controls
9. Analysis plan (code?)
10. Provisions for existing data

https://osf.io/93znh/

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Positive Controls

Outcome neutral tests

Verify validity of manipulation or measurement

NOT the study's main outcome

Ambiguous Preregistration Case

We expect to collect data from 100 subjects.

Ambiguities

- Before or after exclusions?
- Individually or in groups?
- What happens if you can't get 100?

Ambiguous Preregistration Case

A two by three mixed ANOVA will be the designated statistical analysis.

Ambiguities

- Which planned comparison tests the hypothesis?
- Any assumption checks before analysis?
- Any follow up tests/ contrasts?

⬆️ Transparency

⬆️ Rigor/Quality

⬇️ QRPs/overfitting

Eight Myths about Pre-Registration

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1. Stifles creativity
2. Mandates guarantee quality
3. Mostly addresses *p*-hacking
4. Solves *p*-hacking
5. Not suitable for exploration
6. Doesn’t work for all areas
7. Solves file drawer problem
8. It’s easy!

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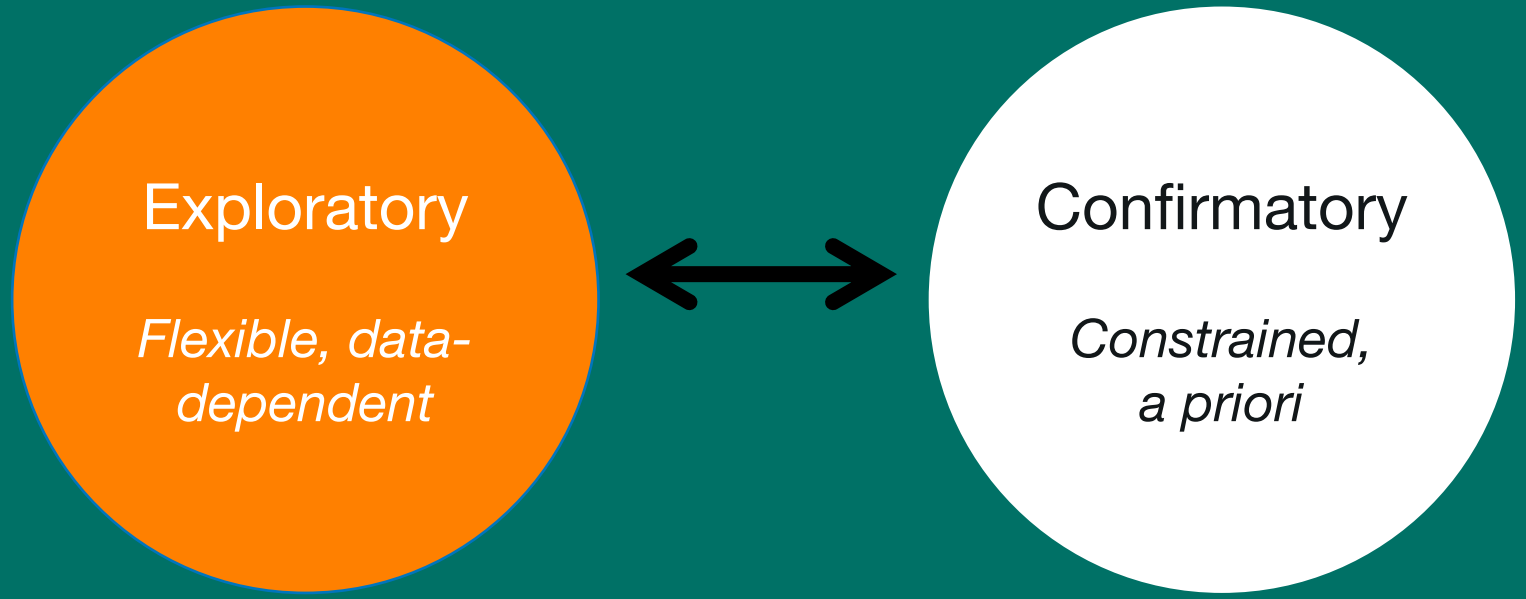

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Mandates incentivize.

Mandates signal.

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Not just about *p*-hacking

Specifying design and analysis plan ahead of time prevents data dependent decisions later

If hypotheses are specified a priori, also have a chance to falsify

If thorough, also a chance to improve your design, catch problems early

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Doesn't always solve *p*-hacking

Pre-registration prevents

1. *p*-hacking
2. data dependent decisions

ONLY to the extent that the pre-reg constrains later flexibility

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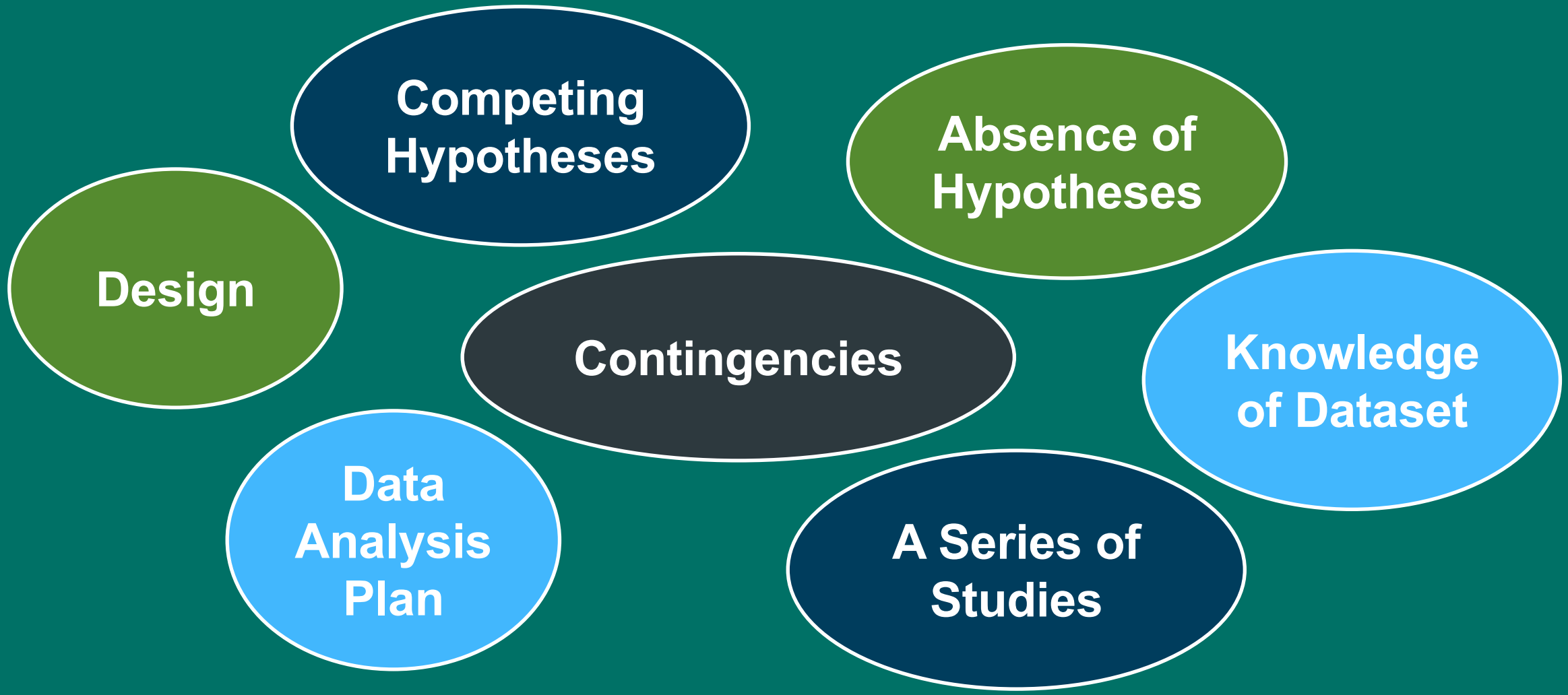
Theory-derived hypotheses are not required for pre-registration

Things You Can Pre-Register



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Pre-reg for everyone? Yes!

Practices will look different in different communities.

Some fields analyze large secondary data sets.

- See Weston et al. (in press)
- Template

Open research notebooks: alternative technique; focus on transparency

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Key Terms & Concepts

- Pre-registration vs. registered report
- Registration vs. pre-registration
  - clinicaltrials.gov

Study Registries vs. Pre-Reg

Study registries track the existence of studies.

If all studies are registered, and all results are reported, file drawer problem is solved.

Pre-reg needs to be public and findable to solve file drawer.

Registered Reports

Over 200 participating journals!

https://cos.io/rr

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Anyone can pre-register, but doing it well is challenging.

VOLUME 38 ISSUE 21 AMERICA'S FINEST NEWS SOURCE

National Science Foundation: Science Hard

INDIANAPOLIS—The National Science Foundation's annual symposium concluded Monday, with the 1,500 scientists in attendance reaching the consensus that science is hard.

"For centuries, we have embraced the pursuit of scientific knowledge as one of the noblest and worthiest of human endeavors, one leading to the enrichment of mankind both today and for future generations," said keynote speaker and NSF chairman Louis Farian. "However, a breakthrough discovery is challenging our long-held perceptions about our discipline—the discovery that science is really, really hard."

"My area of expertise is the totally impossible science of particle physics," Farian continued, "but, indeed, this newly

see SCIENCE page 10

Right: Farian explains the NSF findings.

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Thank You!

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Email: k.corker@gmail.com

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