# Insights and Practical Considerations *for Communicating Basic Science*

## HIGHLIGHTS

**SciPEP**
Science Public Engagement Partnership

***Partnership between the U.S. Department of Energy's Office of Science and The Kavli Foundation to deepen the understanding of effective public engagement around basic research.***

THE KAVLI FOUNDATION

U.S. Department of ENERGY | Office of Science

DOI: 10.17605/OSF.IO/2CGSM

# What this slide deck is (and isn't)

## This slide deck is...

- **A distillation of insights and inferences** about basic science communication discussed in *Insights and Practical Considerations for Communicating Basic Science*, a resource created by SciPEP

**FULL REPORT**

DOI: 10.17605/OSF.IO/4KGQF

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## This slide deck is not...

- **An exhaustive list** of every insight from five years of the SciPEP collaboration.

**Find more information,** including landscape reports, social science research, and conference session recordings:

**scipep.org/resources**

Little of the research published about science communication and engagement is *specific to basic science.*

## Less than 5%

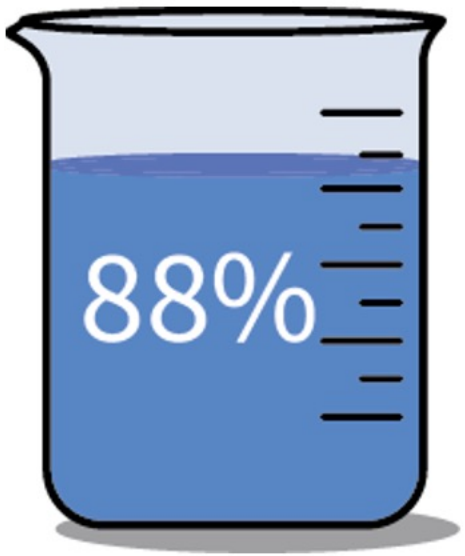
Percentage of articles substantively focused on basic science found in a survey of ~2,300 articles in four major science communication journals

## 43

Number of articles involving communication of basic science found in a survey of 1.5 million articles in STEM journals

Newman et al. (2021) DOI: 10.17605/OSF.IO/K93CJ
Besley et al. (2021) DOI: 10.17605/OSF.IO/UECXN

# U.S. public support for basic science is strong (1 of 2)




Of adults in the United States polled in 2022, **88% agree that scientific research that advances knowledge deserves federal government funding**, even if it brings no immediate benefits.

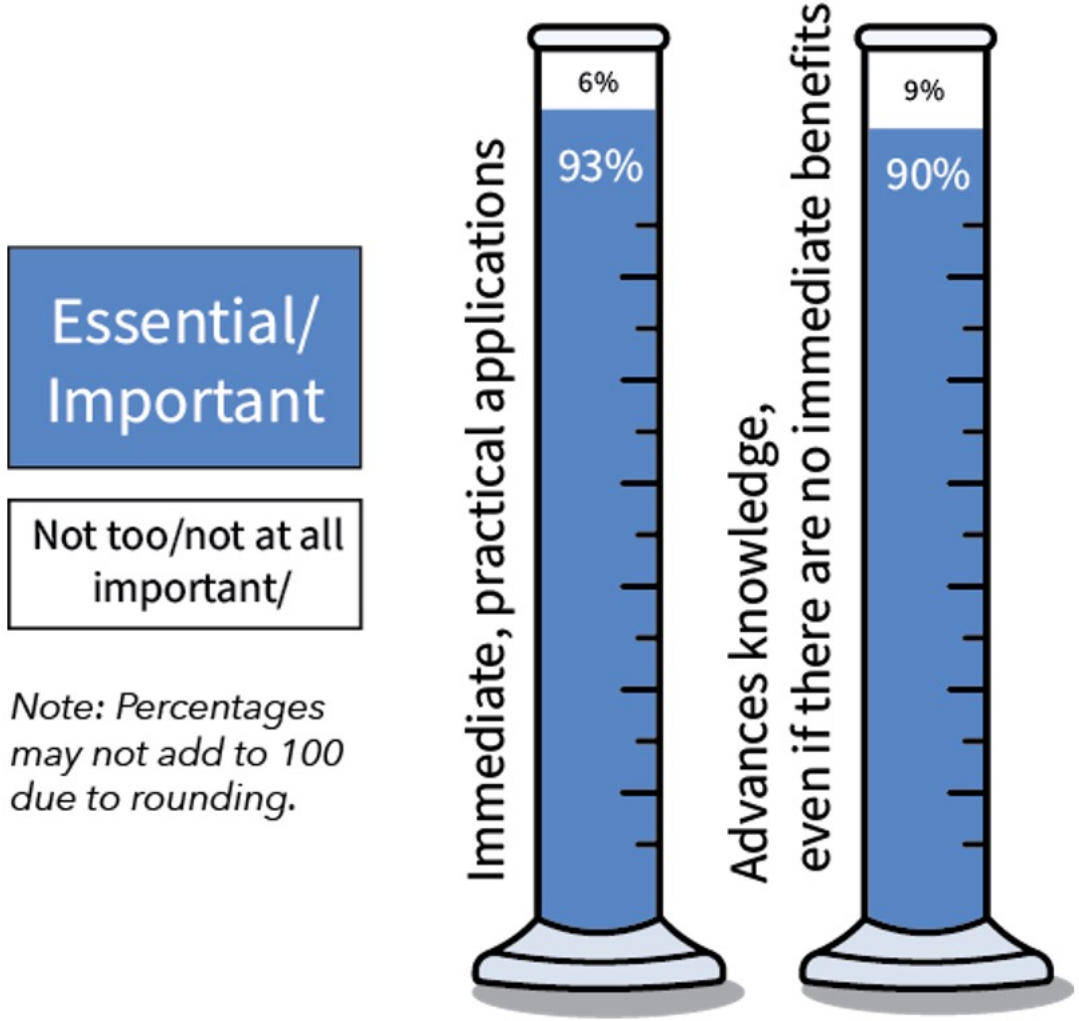
**And support is consistent,** remaining above 80% since 1999.

Southwell et al. (2024) ncses.nsf.gov/pubs/nsb20244/figure/PPS-1

# U.S. public support for basic science is strong (2 of 2)

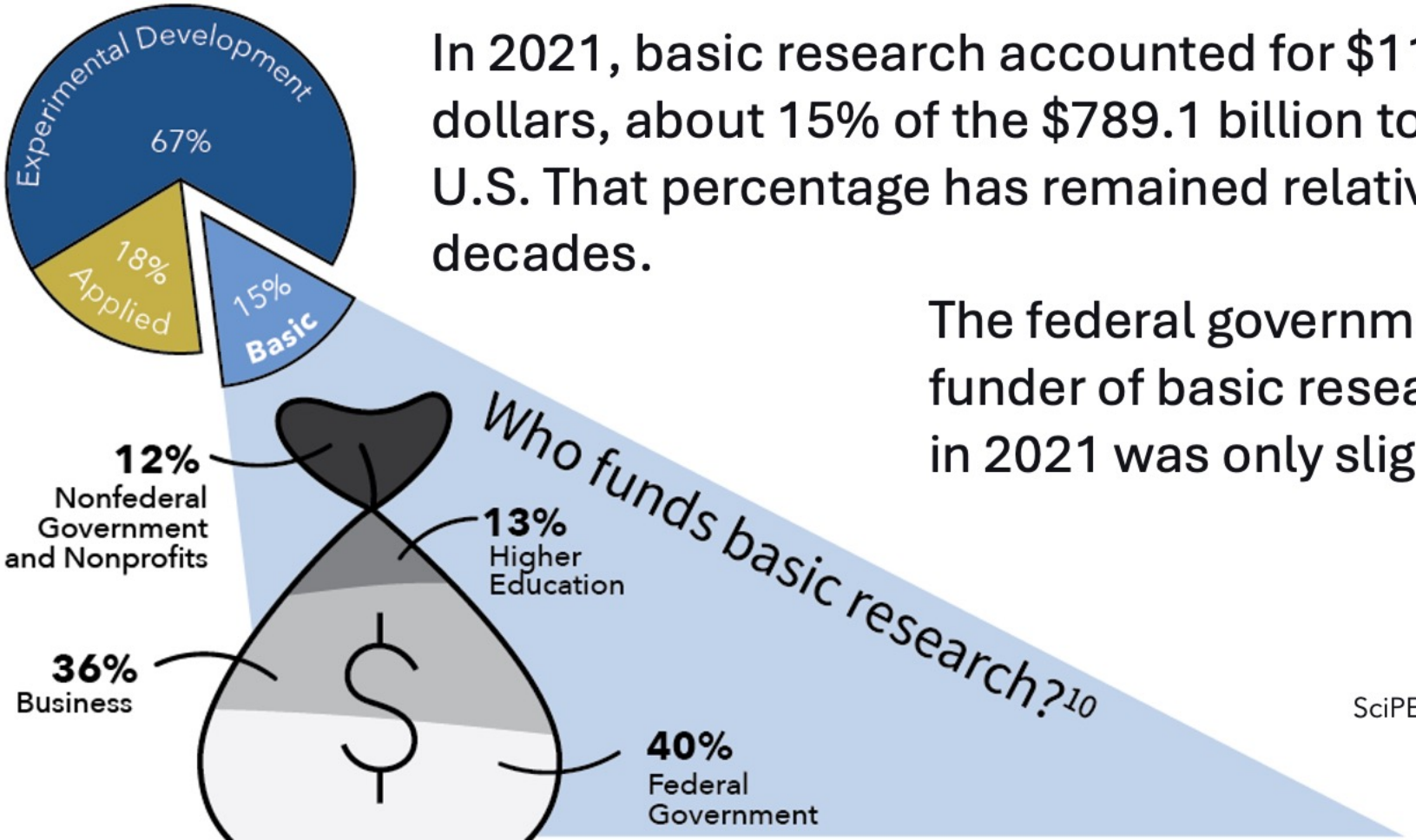
**They also think it matters for society.**

Of adults surveyed in 2019, 90% or more said that basic and applied research are essential or important.




Funk et al. (2019) Page 88 of https://pewrsr.ch/3TGPQWJ

# Basic research funding 101




In 2021, basic research accounted for $118.6 billion in current dollars, about 15% of the $789.1 billion total R&D funding in the U.S. That percentage has remained relatively constant for seven decades.

The federal government is still the largest funder of basic research, but its investment in 2021 was only slightly above business's.

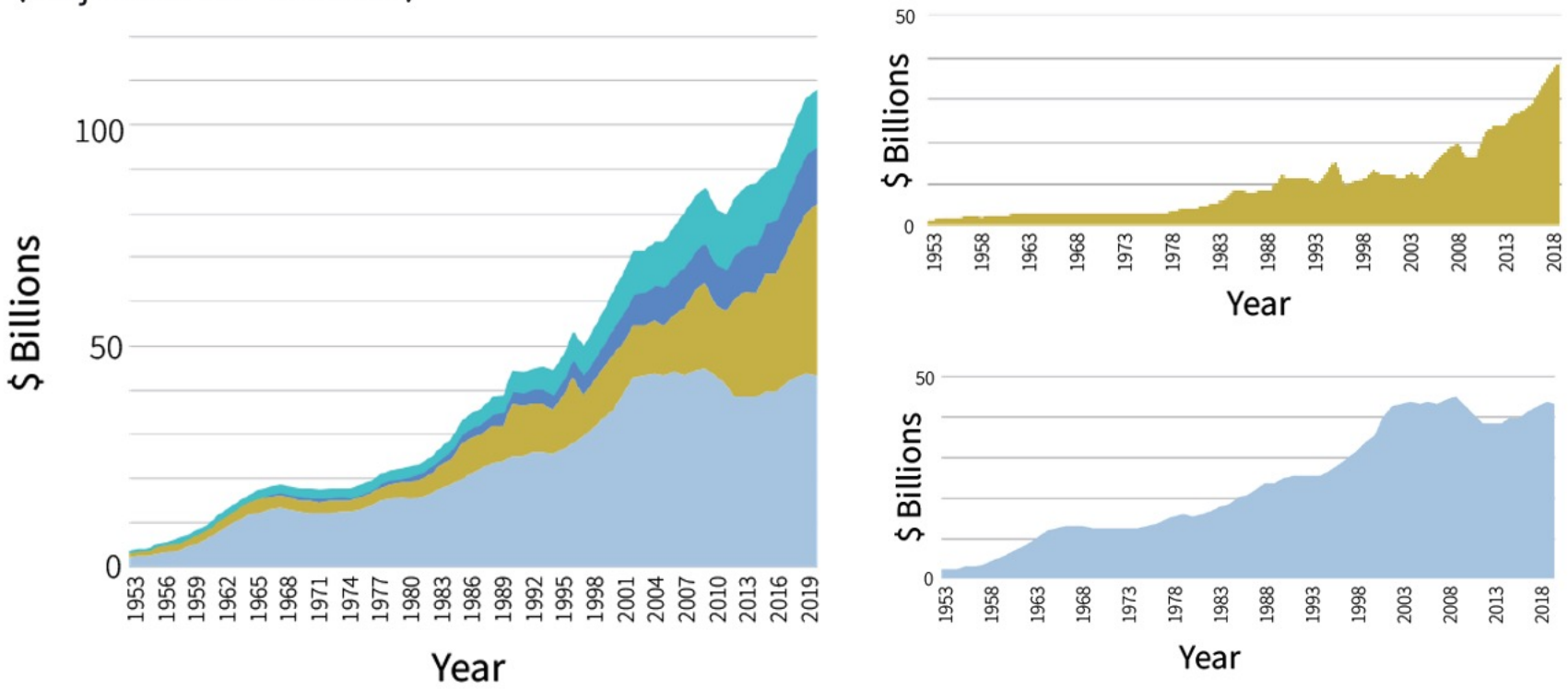
SciPEP analysis of ncses.nsf.gov/pubs/nsf24318/table/2 and ncses.nsf.gov/pubs/nsf24318/table/3
ncses.nsf.gov/pubs/nsb20243/figure/15

# Business is catching up to the federal government in basic research funding

The federal investment in basic research has been fairly stable since 2003, after adjusting for inflation. In contrast, the private sector has more than tripled its investment since 2003.

The private sector overtook the federal government in overall R&D spending in 1980.

**U.S. basic research expenditures, by source of funds: 1953-2021**
(Adjusted for inflation)




SciPEP analysis of ncses.nsf.gov/pubs/nsf24318/table/7
SciPEP analysis of ncses.nsf.gov/pubs/nsf24318/table/6

# Basic scientists may need help to identify and prioritize communication goals—a crucial component of strategic science communication (1 of 2)

~1,900 scientists focused on basic research rated eight communication goals' importance to them:

They had not previously given much consideration to most of the goals the survey listed.

They tended to rate all eight goals highly. (See next slide.)

> "Basic scientists are probably going to have to work a little bit harder than applied scientists to communicate effectively, because it might be harder for them to latch onto a goal that is meaningful to them."
>
> -Anthony Dudo

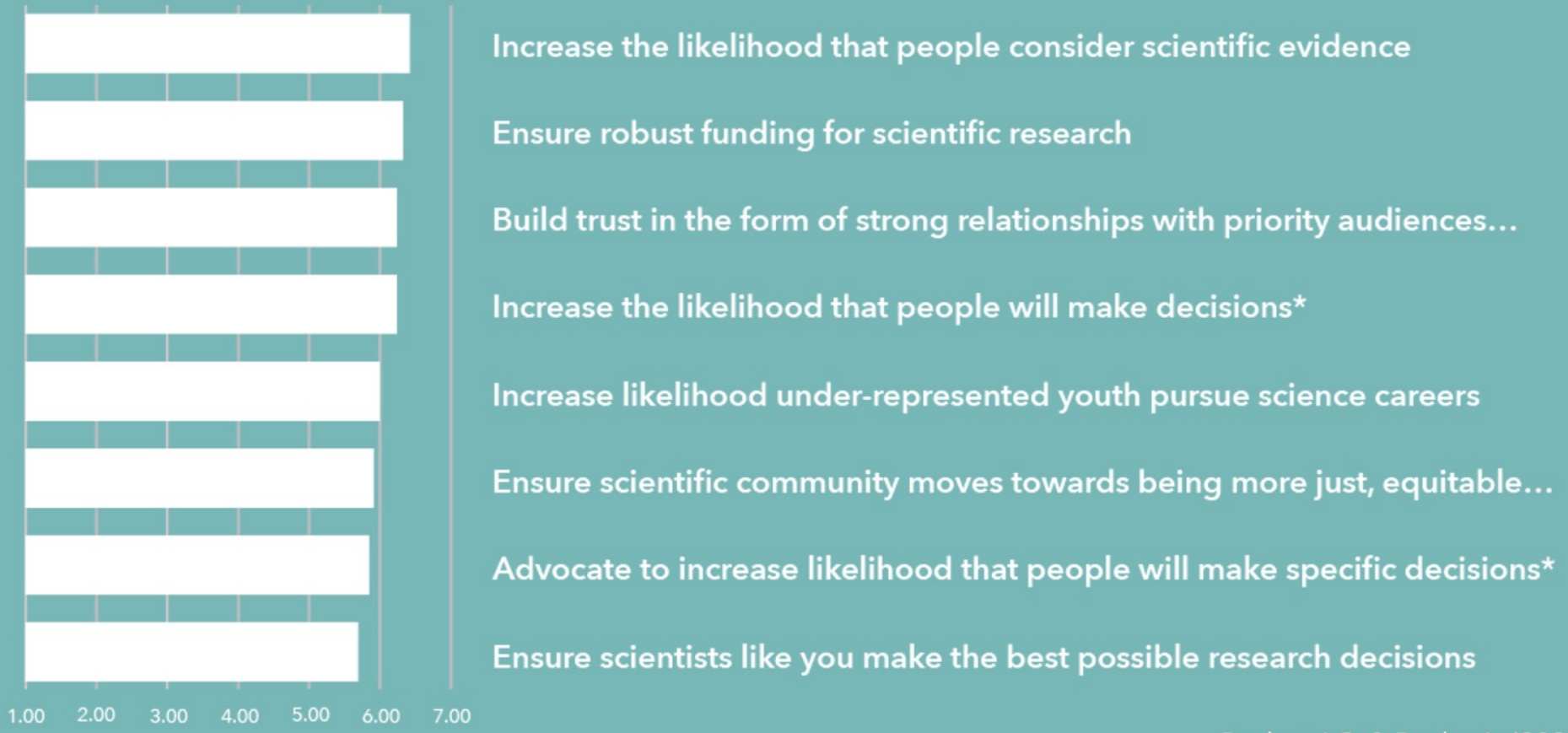
Besley, J.C. & Dudo, A. (2023). DOI: 10.17605/OSF.IO/R4AQ5

# Basic scientists surveyed tended to prioritize every example science communication goal (2 of 2)

Average response to question:

**"In general, when choosing to communicate with your priority audience(s), how important or unimportant should the following type of goal be for scientists like you?"**

(1 = Very low importance, 7 = Very high importance)




Besley, J.C. & Dudo, A. (2023). DOI: 10.17605/OSF.IO/R4AQ5

# How do audiences' views of science differ from basic researchers' views about their own work? (1 of 2)

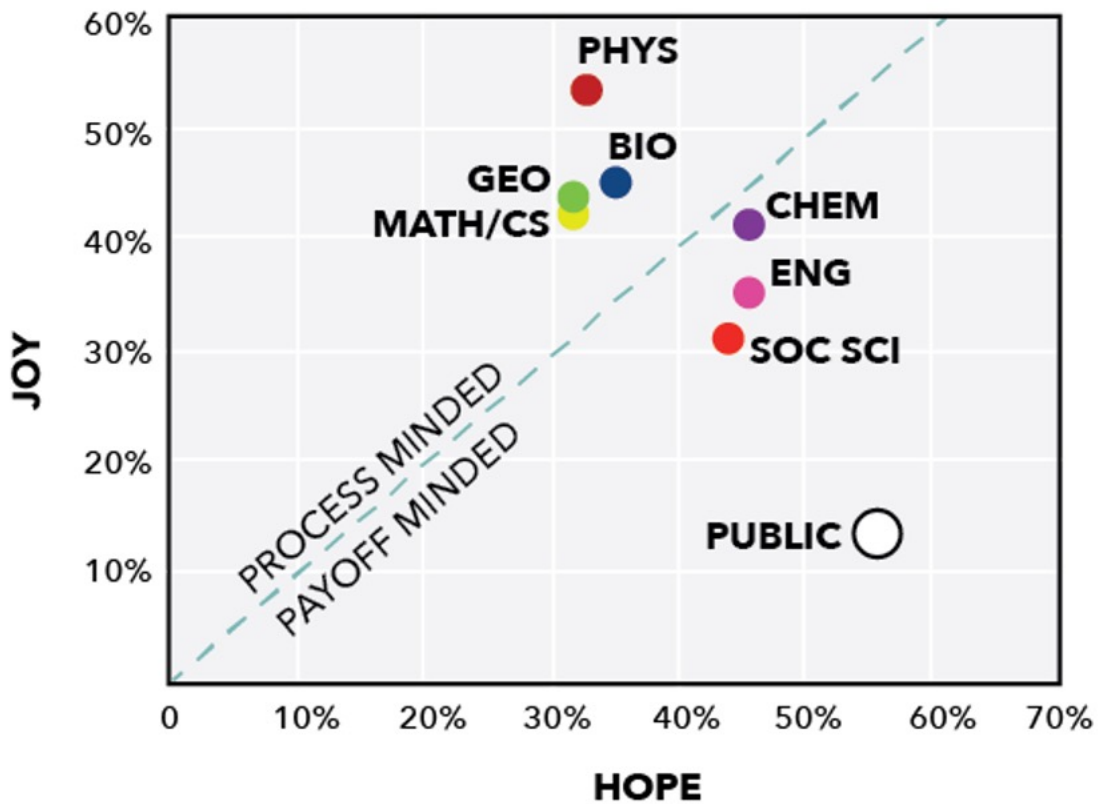
| | |
|---|---|
| **SURVEYS ASKED** | "Which word best describes what you feel when you hear the word science?" |
| **U.S. PUBLIC** | Most say "hope." |
| **WORKING INTERPRETATION** | Science works toward payoffs that will improve the world. |
| **SCIENTISTS** | Many say "joy." ("Hope" is also common.) |
| **WORKING INTERPRETATION** | Scientists find joy and excitement in the process of research itself. |

Multiple studies summarized in Volpe, C. M. (2023). DOI: 10.17605/OSF.IO/3K6YU

# How do audiences' views of science differ from basic researchers' views about their own work? (2 of 2)

## Plotting Hope vs. Joy by field of science:

Researchers in more basic fields of science are on average more joy-minded. They might need to do more work than applied researchers to connect with audiences, who tend to be more hope-minded.




Multiple studies summarized in Volpe, C. M. (2023). DOI: 10.17605/OSF.IO/3K6YU

# Does the term “basic science” even matter?

## When engaging audiences, is it important to make distinctions between basic and applied science?

Some people may have never heard of “basic” (or "applied") science. Terms like "discovery" and "invention" poll better with U.S. audiences.

Much of the U.S. public equates science with payoffs. Don’t tell audiences that basic research has no application. Instead, focus on exploration of the unknown, wherever it may lead.

Context about what your science is gives audiences a way to assess basic science.

Few scientists do basic research exclusively. Many scientists describe their work as a mix of basic and applied.

Newman et al. (2021) DOI: 10.17605/OSF.IO/K93CJ
Volpe, C.M. (2023) DOI: 10.17605/OSF.IO/3K6YU
Kennedy, B., Tyson, A. (2023) https://pewrsr.ch/44Qu85U
SciPEP. (2023) DOI: 10.17605/OSF.IO/SRHFV

# What makes people curious about basic science?

The potential to learn new or useful knowledge can trigger curiosity.

What knowledge is "useful" is in the eye of the beholder–if you build the case for value, curiosity will come.

Curiosity is contagious–people's interest in learning answers to everyday science questions was related to how popular the questions seemed to be among others online.

Getting a gratifying answer to a burning question doesn't douse the flame of curiosity–it stokes it.

Liquin, E.G., Lombrozo, T. (2020) DOI: 10.1016/j.cogpsych.2020.101276
Dubey, R., Griffiths, T.L., Lombrozo, T. (2022) DOI: 10.1016/j.cognition.2022.105193
Dubey, R., Mehta, H., Lombrozo, T. (2021) DOI: 10.1111/cogs.12937
Liquin, E.G., Lombrozo, T. (2022) DOI: 10.1016/j.cogpsych.2021.101453

# Curiosity sparks interest in science, but making connections with other interests may be more important for Black and Latino audiences

SURVEY OF OVER 2,500 U.S. ADULTS

## What motivates your interest in science topics?

**#1** answer across all demographics → **Curiosity**

Respondents motivated by curiosity were more likely to show **interest in one-time engagements** such as watching a science themed TV program.

## Do you see connections between science and non-science interests?

**3/4** of Black and Latino respondents say lots or some connections

**2/3** of White respondents say lots or some connections

Those who saw connections were more likely to **engage in participatory activities** like collaborating with scientists.

Volpe, C., Klein, E., Race, M. (2022). https://bit.ly/EngagingWithScience

When audiences from underrepresented groups engage with science, it doesn't necessarily mean they have no barriers. **People may participate in spite of them.**

Respondents **most primed to engage** in a range of science activities were **more likely to report barriers** to participation.

Black and Latino adults identified **50% more barriers** than White adults.

"That means people are putting in extra work to engage despite the barriers they face."

-Michelle Warren, M.A.

"If curiosity and connection are the gas pedal that drives willingness to engage with science, then barriers are the brakes. "

-Christopher Volpe

Volpe, C., Klein, E., Race, M. (2022). https://bit.ly/EngagingWithScience

# Your awe might differ from someone else's

Anecdotally, scientists who communicate their basic research say that they often communicate to inspire awe and wonder.

Research suggests that experiences of awe are highly personal, shaped by each individual's past encounters with similar emotions.

When engaging with science, people can experience different types of awe, such as thrilling, entertaining, or meditative, depending on their unique situation and previous experiences.

Understanding "flavors" of awe and tailoring engagement strategies can help communicators achieve objectives such as building trust, fostering connections with nature, or sparking excitement about science.

Silva Luna, D., Bering, J.M. (2021). DOI: 10.1177/0963662520963256
Silva Luna, D., Bering, J.M. (2022). DOI: 10.1177/10755470221098100

# Curiosity gets people to the door. Might connection bring them through it?

## Taking relevance beyond utility may help connect audiences with basic science

**"Relevance can be but is not always equivalent to utility.** While utility implies a direct practical benefit, relevance transcends applications, encompassing a broader connection to people's lives, cultures, and identities.

Making basic science relevant involves more than just demonstrating its potential usefulness; **it requires weaving scientific concepts into the fabric of society, embedding them within the contexts of people's everyday experiences."**

-Dr. Mónica Feliú Mójer

# More questions than answers

Insights gathered through SciPEP are not an end, but a beginning for a burgeoning new field examining communication specific to basic science.

To answer research questions rigorously, **more partnerships are needed** between scholars that study basic science communication and practitioners of basic science communication at universities, museums, government agencies, foundations, and nonprofits.

The SciPEP resource *Insights and Practical Considerations for Communicating Basic Science* was **created to inspire further explorations and catalyze conversations** that inform future research, funding, training, and practice.

**Let's get collaborating!**