

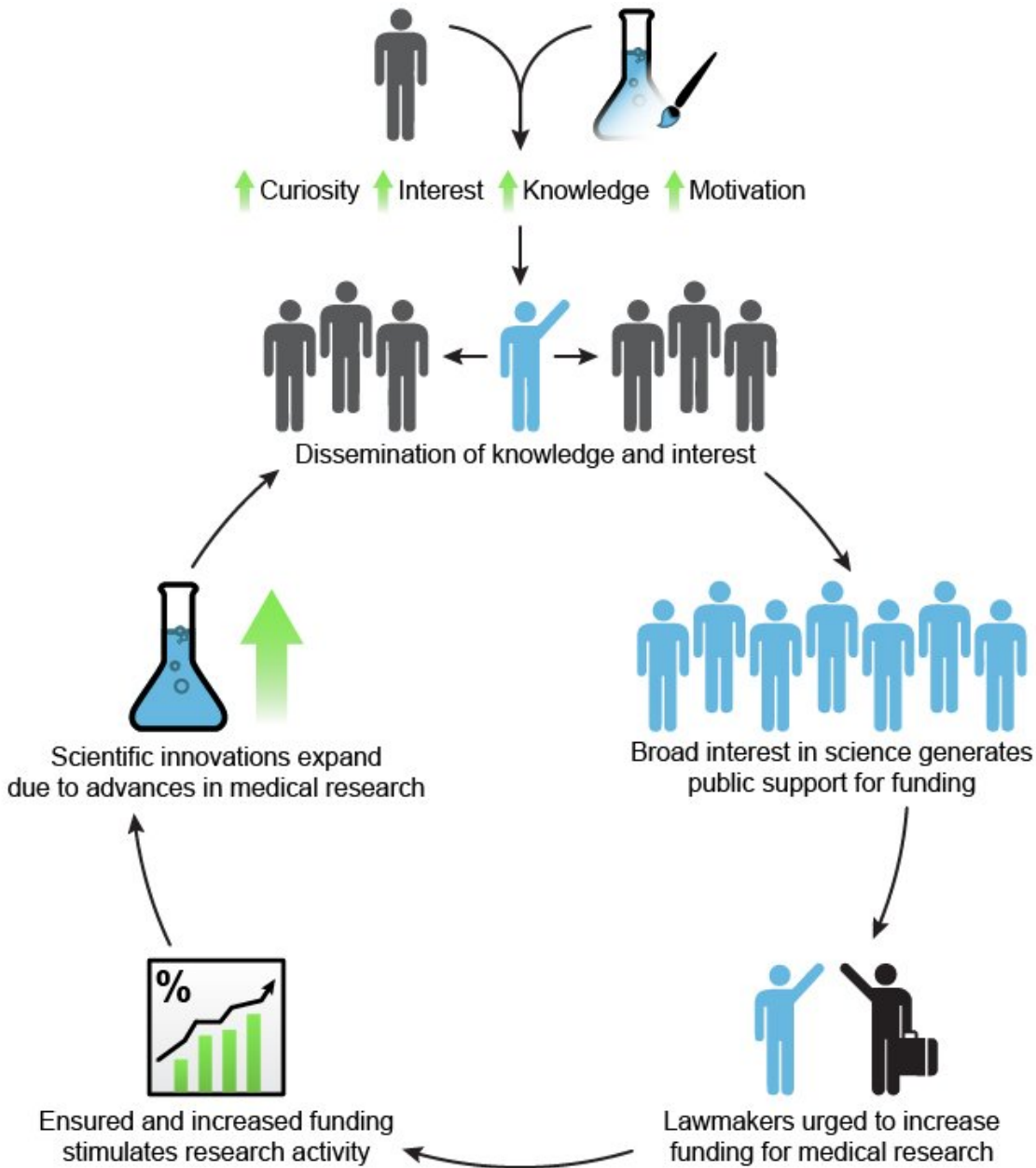
Catalyzing broad public interest in scientific research

Funding is the lifeblood of medical research, and the United States is hemorrhaging. Falling to new lows, federal research and development funding plummeted below 0.8% of our GDP—the lowest in more than 40 years — and collapsed to just 3.8% of the federal budget in response to recent debt-ceiling crises and sequestrations (1). Slashed funding promotes virtually insurmountable competitiveness among researchers for access to a vanishingly small number of grants. Consequently, nascent scientists struggle to initiate promising careers and the livelihoods of even well-established researchers are jeopardized. Although reduced funding protects against perilous economic climates, the public bears the ultimate burden of sluggish advances in hopeful research endeavors and a stalled economy devoid of innovation. The United States consistently champions research for treatments against our most devastating diseases, but the vitality of these efforts wanes as critical funding evaporates. To sustain and expand funding for medical research, long-term solutions rest in invigorating broad scientific interest and understanding in the public.

Indeed, recent policy studies have shown that citizens' scientific interest and knowledge accurately predict significantly higher levels of public support for science and technology funding (2,3). Broad public support compels lawmakers to sponsor legislation in favor of constituents' desires; in the context of medical research, greater science interest and understanding produces momentum for tenable and enhanced funding. Not surprisingly, the erosion of research expenditures mirrors the underperformance of Americans in scientific interest and knowledge assessments. According to the National Science Board in 2014, less than half of Americans reported being "very interested" in new scientific discoveries, while the percentage of Americans "not at all interested" nearly doubled in 2010 (4) . The Pew Research Center found in 2012 that only 16% of Americans follow news about science and technology "very closely," which has declined over the past two decades, and the greatest attrition in interest was seen in respondents following health news (5) . As Americans lose interest in science, their performance

on basic scientific knowledge evaluations concomitantly suffers. For example, only 20% of Americans could correctly identify nitrogen as the most abundant gas in our atmosphere (6), and barely a third understood the fundamentals of scientific inquiry—the lowest amount in recent years (4). Perhaps most dismayingly, assessments in K-12 education uncover how ill-equipped students are to contribute to the next generation of science leaders. The National Assessment of Educational Progress revealed that 35% of eighth grade students have a below basic understanding of science, and not even a third have acquired proficiency in scientific literacy (7). Those rates fared even worse for high school seniors: 40% lacked a basic understanding of science, and only 21% possessed scientific proficiency (8). Declining interest, coupled with clear deficiencies in knowledge and education, divest the United States of its prominence as an international leader in science and endanger the very funding that ensures research for public betterment. Solutions must triage these inadequacies to stem budgets from bleeding what shrinking support for medical research still exists.

Upon recognizing this problem, I sought to find an innovative way to disseminate scientific information while revitalizing interest in non-expert audiences. I became inspired by science-as-art images during a research internship in Paris, where pedestrians would stop to observe dramatic, aesthetic images captured during the research process and read about the science behind them. Art innately captivates the observer and elicits fundamental questions about subject, meaning, and purpose. While interpretations of art are often open-ended, science can intervene to describe phenomena concretely, explain logic behind unexplored material, and link information to immediate human relevance. In essence, art facilitates our understanding and interest in science by mapping unfamiliar territories with familiar experiences.



Science-as-art stimulates knowledge and interest that can be widely disseminated through online platforms. By interacting with science-as-art imagery, viewers become engaged with science and experience increased levels of interest—even if they initially report steadfast indifference to science. Implementing science-as-art platforms online, such as through Biocanvas, allows for the wide and rapid dissemination of scientific interest and knowledge. As public interest in science grows, broad support for medical research funding concurrently resurges. Lawmakers respond by sponsoring legislation that secures and increases funding, stimulating research activity. As advancements in research emerge, new knowledge and innovations return to interested readers and ignite interest in disengaged individuals through science-as-art. The cycle begins again as this new information propagates throughout an engaged public.

Using this idea, I created an online platform called Biocanvas that curates science-as-art visuals accompanied by easy-to-understand captions. Today, Biocanvas has a daily readership of over 170,000 global users who interact with and share images thousands of times every day, resulting in a wide, rapid dissemination of scientific knowledge. I conducted a large survey in July 2013 to assess the effectiveness of Biocanvas in stimulating scientific interest. The results were staggering: Of respondents who indicated a very low interest in science, 88% said Biocanvas made them want to learn more about each image, 76% wanted to read about additional science subjects, and 51% reported they wanted to study science more. This surge in interest was even greater in other key groups, including respondents under 18, over 50, and adults lacking a post-secondary education. User comments anecdotally validate these numbers: Students have changed their majors to nursing and biology, middle school teachers have used Biocanvas to spark classroom discussions in cell biology, and readers have contacted legislators to support funding for neglected diseases. Science-as-art imparts scientific interest and understanding in an approachable, compelling way, and Biocanvas capitalizes on that concept to generate broad interest in groups most vulnerable to disengagement. Implementing science-as-art programs to communicate late-breaking research broadly would enliven public interest, alleviate the dismal status of current science affairs, and generate impetus for policies promoting research expenditures (see figure).

Certainly, medical research funding is complex and will require a multifaceted approach to resuscitate science advancements. Lack of scientific interest and knowledge suffocates these advancements by propagating apathy and quelling advocates of research funding. Though it is one simple factor, science-as-art renews interest and understanding in the sciences, and Biocanvas acts as a conduit to broadcast this media widely to non-expert audiences. Reigniting scientific interest will be a key strategy to undo the mire stagnating progress and secure popular

and legal support for medical research funding that propels groundbreaking work into the future.

1. American Association for the Advancement of Science.
2. Muñoz A, et al. 2012. Public understanding of science.
3. Sanz-Menéndez L., et al. 2013. Science and public policy.
4. National Science Board. 2014. Science and engineering indicators.
5. Pew Research Center. 2012. "In changing news landscape, even television is vulnerable."
6. Pew Research Center. 2013. "Public's knowledge of science and technology."
7. National Assessment of Educational Progress. 2011. Science assessment.
8. National Assessment of Educational Progress. 2009. Science assessment.