



# Leverage Research

*Annual Report 2021*

## Executive Summary

Leverage Research is a non-profit research institute dedicated to identifying and pursuing particularly high-value research opportunities, especially those related to science and technology. Our present work focuses on early stage science—research conducted during the earliest stages of discovery—on the view that advances in early fields, along with a better understanding of how such advances are made, can benefit society in significant ways. Through our programs and efforts at public engagement we study, communicate lessons about, and attempt to conduct early stage science.

Over the last year, building on initial successes in 2020, we developed and expanded our programs, built new alliances, and communicated much more about the institute and its history. This Annual Report describes the work the institute has done over the last five quarters, Q1 2021-Q1 2022, with respect to our programs, efforts at engagement, and the institute itself.<sup>1</sup>

**(1) Programs:** *Develop and expand our programs pertaining to early stage science.*

We made progress in our History of Science (formerly “Early Stage Science”) research program, where we completed three [new case studies](#) in the history of electricity, updated our case study format, and had our first articles accepted for publication. We also decided on a concrete plan for our Exploratory Psychology research program and allocated it a dedicated program manager, established a new program entitled “Bottlenecks in Science and Technology” with a positively received [first workshop](#), and put our Research Fellows program on indefinite pause.

**(2) Engagement:** *Provide an accessible explanation of our past and present work, build alliances with external researchers, and expand our engagement with audiences interested in the future of science.*

We kept our supporters informed about our efforts with [regular updates](#), communicated about our research on podcasts, at events, and via other media, and worked to improve the public’s understanding of the institute. We also built connections with potential collaborators on bottlenecks-related projects in several fields and expanded the institute’s base of support with a successful [first public fundraiser](#).

**(3) Institute:** *Continue defining the organization internally and hire for key roles.*

We took over full responsibility for our own operations, defined important roles and responsibilities further, reallocated staff to new positions (including promotions), and adopted new policies. We also prepared to make new hires but did not make as much progress on this as we had hoped, deprioritizing hiring during the last two quarters in favor of other aims.

In the later months of 2021, we were surprised and saddened to learn about negative experiences that some of our former teammates had as part of Leverage’s early research collaboration, spanning the years 2011 to 2019. This prompted us to [publicly apologize](#), provide support, and look for opportunities to [learn from past mistakes](#) while at the same time communicating more about [our work](#) with the public.

Read the 2021 Annual Report to learn more about our recent work and accomplishments, the challenges we face, and our plans and goals for the future.

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<sup>1</sup> We chose this five quarter period as an important [inquiry](#) we conducted pertaining to events in 2021 concluded in early 2022.

## Contents

<b>Executive Summary</b>	<b>1</b>
<b>Contents</b>	<b>2</b>
<b>A Message From Our Executive Director</b>	<b>3</b>
<b>Our Work in 2021</b>	<b>3</b>
Programs	4
History of Science Program	5
Exploratory Psychology Research Program	10
Bottlenecks in Science and Technology Program	12
Research Fellows Program	15
Engagement	16
Sharing Our Work	16
Audience Engagement	17
Answering Questions and Addressing Concerns	18
Institute	19
Strategy	19
Responsibility	20
Development	21
Finances	22
Challenges and Next Steps	23
<b>Plans for 2022</b>	<b>23</b>
Programs	23
Responsible Philanthropy	24
Hiring	24
2022 Budget Projections	25
Support Our Work	26
Donate	27
Learn More	27
Contact Us	27

## A Message From Our Executive Director

The past year was an eventful one for the institute. We saw exciting progress in each of our programs, built a larger base of support with our first successful public fundraiser, and communicated more about our past and present research than ever before. But we also took time to think about our past work, reflect on our mistakes, and offer support for some of our former team members who reported negative experiences as part of our previous research collaboration, 2011-2019 (“Leverage 1.0”).

This took place amid a turbulent public scene. Previous rivalries, which we hoped had faded with the passage of time, erupted with newfound strength first after it was announced that we had won an important grant and again as a report of negative experiences at Leverage 1.0 was made public.

Ourselves still new to public engagement, we found these issues complicated and challenging to navigate responsibly. In essence, our solution was to separate the rivalry-related issues and reputation attacks from questions pertaining to understanding the experiences of our former teammates and providing support where appropriate. With respect to the former, we tried to answer rumor and misinformation with fact and truth, holding ourselves accountable to the public and expanding our efforts to communicate about our work; our efforts in this connection are described in the section on Engagement below under the heading *Answering Questions and Addressing Concerns*.

By far the bulk of our time, however, went into seeking to understand the causes of negative experiences. We launched an inquiry on the topic and then sought to understand some of the mistakes we made during the first decade of the institute’s existence. We focused primarily on errors and missteps that we believe led some people to have had bad experiences at Leverage 1.0 and tried to learn what lessons we could. The inquiry and the subsequent report, which includes our conclusions and the lessons we learned, are covered below in the Institute section under the heading *Responsibility*.

As we now resume normal operations, we face the coming year with both renewed optimism and a new set of uncertainties. With respect to uncertainty, the public confusion around the institute is a continuing issue that may call for further revisions to our approach to public engagement. We expect to meet this challenge with thoughtfulness and care.

With respect to optimism, there are more than enough reasons to be confident about the future. Over the past year, we secured our first publications in the history of science, created a concrete plan for disseminating our psychology research, ran a fun and successful inaugural event for our Bottlenecks work, and succeeded at our first public fundraiser. We also learned a lot from past mistakes about how to better run projects and initiatives in the future. This coming year should bring new successes and if there are challenges and surprises we are better equipped than ever to meet them.

Geoff Anders  
Executive Director

## Our Work in 2021

The bulk of the institute's efforts over the past five quarters have focused on the following goals:

1. **Programs:** *Develop and expand our programs pertaining to early stage science.*
2. **Engagement:** *Provide an accessible explanation of our past and present work, build alliances with external researchers, and expand our engagement with audiences interested in the future of science.*
3. **Institute:** *Continue defining the organization internally and hire for key roles.*

During the first three quarters of 2021, our activities pertained primarily to our programs, especially our History of Science program and our new Bottlenecks in Science and Technology program, with some focus and effort also going into Exploratory Psychology, engagement, and operations.

After learning about negative experiences some individuals had during the research collaboration Leverage Research led from 2011-to 2019, we devoted institute resources to supporting our former team members. This led us to pause our Bottlenecks program and instead prioritize engagement and institute development goals, especially where communicating about our history could provide needed context or where listening and reflection provided the institute with an opportunity for learning and growth.

As our efforts to support teammates and communicate about, and reckon with, the past started to wrap up, we began taking steps to unpause programs and resume normal institute operations, though now with a greater understanding and appreciation for the challenges of supporting our staff both during and after difficult research projects.

What follows in this section of the Annual Report is a discussion of our progress and achievements, as well as challenges and plans for the future, with respect to our programs, engagement efforts, and work pertaining to the institute itself. In the second section, we then summarize our goals for 2022 and ways others can get involved in and support our work.

## Programs

Leverage Research's public programs pertain to *early stage science*—research conducted early in the development of scientific fields, prior to reaching maturity. It is the institute's hypothesis that early stage science is meaningfully distinct from later stage science, that it is a neglected part of the scientific process, and that greater knowledge of and more support for early stage science has the potential to contribute substantially to scientific and technological advancement.

The institute's programs *study, attempt to engage in and apply lessons pertaining to* early stage science:

1. **History of Science program:** *Studying how important discoveries were made in the early history of successful sciences; currently focused on the history of electricity.*
2. **Exploratory Psychology program:** *Disseminating the institute's in-house psychological research tools and methods; the next phase of our own attempt at early stage science.*

3. **Bottlenecks in Science and Technology program:** *Working with others to identify and break bottlenecks in scientific and technological fields; applying insights from our research into early stage science.*

Over the past year, the institute developed its programs, making progress in the History of Science program and giving the Exploratory Psychology program a more definite form. We also launched a new program, Bottlenecks in Science and Technology, and put our Research Fellows program on indefinite pause.

Below we describe each of our programs, including progress made from Q1 2021 to Q1 2022, the challenges pertaining to each, and anticipated next steps.

### **History of Science Program**

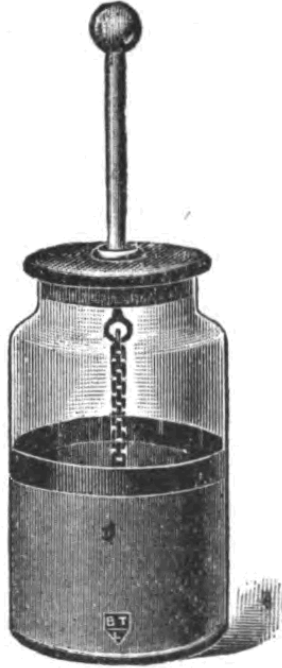
Leverage Research’s History of Science program (formerly our “Early Stage Science” program), studies the process of scientific discovery by investigating how important discoveries in the history of science were made. Researchers produce in-depth historical case studies on major discoveries in the early histories of successful fields, and after producing enough of these, will begin to analyze the studies for potential patterns. Our first field of focus is early electricity, a period beginning with William Gilbert’s isolation of static electric attraction in 1600 and concluding with James Clerk Maxwell’s mathematical synthesis of electricity, magnetism, and light in 1845. In time, our researchers will expand to other fields of study such as chemistry, astronomy, and geology.

To date, the team has produced five studies. In one case—that concerning the origin of the Leyden jar—our researchers found and [translated](#) several unpublished and previously unconsulted letters that helped reinterpret the conditions of the discovery, yielding two publications. The first, which includes a transcription and translation of the letters, is slated to appear in *Lias*, an early modern history journal that specializes in the analysis and dissemination of novel sources; the second, which uses the letters and a range of additional sources to reconstruct an alternative discovery narrative, will be appearing in *Isis*, the longest-running history of science journal in English and an official outlet for the History of Science Society.

Going forward, the program will be led by Evan Pence, who joined our History of Science team in late 2020. Evan holds a Ph.D. in the History and Philosophy of Science and, before joining Leverage Research, worked on similar topics in contemporary neuroscience and psychology. He is currently working on a study on the topic of the identification and production of electric light in the 17th and early 18th centuries and will oversee future hires into our History of Science program.

## Case Studies in the History of Electricity

### 1) The Discovery of the Leyden Jar



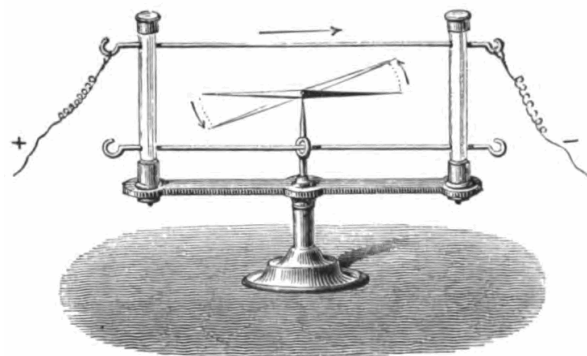
Most accounts of the Leyden jar’s origins suggest it was discovered by accident. In the winter of 1745, Ewald von Kleist and Andreas Cunaeus independently discovered that, by charging a glass container of water and making a connection between the interior and exterior of the vessel, they could produce alarmingly powerful shocks. The most common account contends that though others had experimented with the electrification of water, von Kleist and Cunaeus were amateurs, leading each to make a key oversight: neither thought to insulate the vessel during charging, opting instead to hold it in their hands. This oversight, it is proposed, led to the discovery that charging could take in such a set-up and also deliver such unprecedentedly powerful shocks, which in turn challenged the main theories of the time and drove a revolutionary transition in electrical thought.

Our research suggests a different picture. Rather than a narrative pivoting on theory, we argue that the construction of the jar may be seen as an episode in iterative tool refinement. At the time, electricity was approached with more of an interest in impressive displays and new phenomena than hypothesis testing. The investigations that led to the jar were no different. Drawing on previously unpublished manuscripts, we show that Kleist, the jar’s initial discoverer, was not an amateur in the usual sense of the term—his having read and worked through most of what was then known of the area—and that his discovery came as part of an extended series of experiments geared toward storing and enhancing sparks. What’s more, these experiments involved no evident departure from standard investigative practices (i.e., insulation was explicitly incorporated into the set-up), undercutting the standard “accident” account. Finally, we argue, an evaluation of initial reactions suggest that its status as a useful tool and an entertainment were far more significant than any theoretical puzzles for the jar’s spread. Its significance for theory became clear only after Franklin’s detailed exposition some years later.

*Status: Working paper completed. Read the [case study](#) and [research highlights](#).*

### 2) Hans Christian Ørsted and the Discovery of Electromagnetism

Hans Christian Ørsted’s 1820 report that current-carrying wires were capable of deflecting magnetic compass needles represents the first widely recognized demonstration of electromagnetic interactions and is commonly taken as the starting point of modern, unified treatments of the two forces. In reviewing the



experiment's specification, however, one finds little by way of motivation or technology that was not present years earlier. Electricians had long suspected that electricity and magnetism could be related, and by 1802, battery designs had reached a point where they could produce enough current to generate clear magnetic effects.

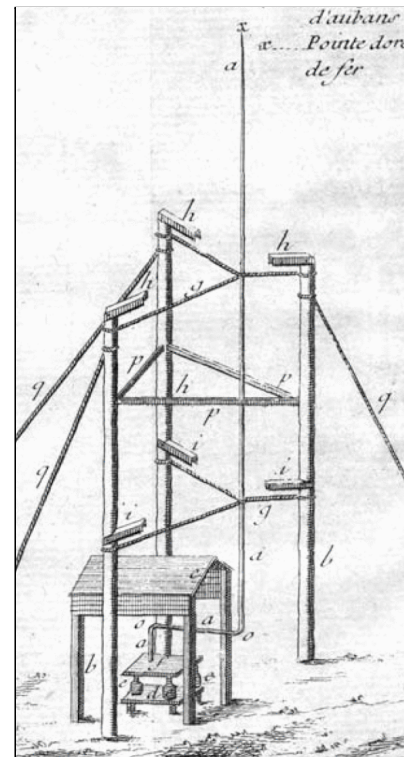
This raises a question: if the materials and interest were present, why did it take some eighteen years for them to come together in Ørsted's design? Our study develops an answer by reference to several factors. First, Ørsted benefitted from a set of metaphysical assumptions informed by his reading of the philosophers Immanuel Kant and Friedrich Wilhelm Joseph von Schelling. These led him to seek unifying structures with greater zeal than most of his contemporaries, even those who suspected a connection between electricity and magnetism. At the same time, the theoretical presuppositions of his contemporaries pushed them toward alternative approaches. Those favoring a strict quantitative approach were more inclined to formalize known phenomena or focus on areas where precise instrumentation was available. Dedicated experimentalists, meanwhile, tended to associate the current-producing battery arrangement used by Ørsted with galvanism, a force whose relation to electricity was unclear.

*Status: Working paper completed. Read the [case study](#) and [research highlights](#).*

### 3) The Development and Spread of Franklinian Theory

Benjamin Franklin's fluid theory of electricity is widely seen as the domain's first organizing system. Developed between 1747 and 1751, the framework cemented terms and practices still in use today, helping catapult its developer from virtual unknown to perhaps the most respected electrician in Europe. Traditionally, this success has been attributed to the singular novelty and explanatory scope of his ideas. Our own research suggests that most of what came to be known as the Franklinian system was already in circulation, however. Indeed, a nearly complete anticipation of the content of Franklin's theory can be found in the work of German electrician Jacob von Waitz, suggesting that conceptual novelty played little role.

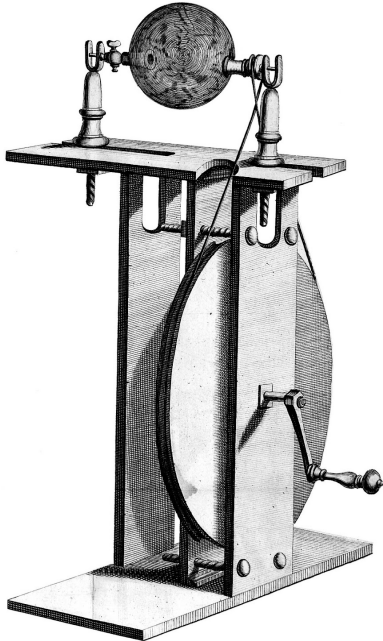
Instead, we argue, what set Franklin apart from earlier efforts were his self-consciously practical approach to the topic and the fact that he fit better within the sociopolitical environment emerging at the time. For one, Franklin's system benefited from a direct mode of exposition and an emphasis on the tangible, features honed over his many years as a journalist and publisher. As a result, his work proved far easier to follow and digest than that of contemporaries like Waitz, particularly for those entering the field (a rapidly growing contingent at the time). The same practical bent led him to emphasize applications over high-level theory, securing him more readers than was standard at the time. The lightning rod is doubtlessly the best known of his electrical inventions, but his writings are rich with designs, most of them made possible by the quite recently discovered Leyden jar. Finally, he received an





unprecedented degree of support from other Enlightenment figures, who saw in the “freethinking” Franklin a fellow traveler and were all too eager to sing his praises.

*Status: Working paper completed. Read the [case study](#) and [research highlights](#).*



#### 4) The Isolation of Electric Light

The production of sparks and light by means of friction is one of the earliest and most significant phenomena for the history of electrical research. Relative to the development of Franklinian theory, the creation of the Leyden jar, and other famed discoveries, however, this development has received comparatively little study. Key work has been done to locate the lines of personal influence and the theories engendered by the discoveries involved, but much about the experimenters’ research process and the material foundations required for the discovery remain unclear.

Our study aims to fill this picture out. Focusing on the physical/technical constraints faced by early investigations and the steps needed to differentiate electric light from other forms of luminous discharge, we trace the phenomenon’s path from early descriptions of flashes emanating from broken sugar crystals to a controlled and widely reproduced experimental product. Of special importance, our ongoing study suggests, was the existence of

sustained craft traditions surrounding glass, the professionalization of instrument production, and the spread of a Baconian experimentalism that viewed extensive pattern extraction as an essential and prior step in the development of theories in natural philosophy.

*Status: Research in progress*

#### *Planned Case Studies*

To develop a holistic analysis of how early scientific advance occurs, it will be necessary to assemble a sufficiently large and representative corpus of studies. This in turn will require the examination of discovery in numerous fields. In the near term, however, we plan to continue our investigations into electricity. Upon review, we have decided to omit the initially planned study on Coulomb and the torsion balance, integrating the material that would have been covered into another study. We have also discussed potential additions, though have not made any at present.

The following diagram represents our progress thus far and which studies in electricity remain to be done.



## History of Electricity

- #1 William Gilbert and the discovery of ‘electricks’
- #2 Exploring electrical substances
- #3 The discovery of electric fire and light
- #4 Gray and Dufay’s experiments in conduction and insulation
- #5 The discovery of the Leyden jar
- #6 Benjamin Franklin and the lightning rod
- #7 Alessandro Volta and the electrophorus
- #8 Alessandro Volta and the Voltaic pile
- #9 Hans Christian Ørsted and magnetic deflection
- #10 André-Marie Ampère on circuits
- #11 Georg Ohm and Ohm’s law
- #12 Michael Faraday and the discovery of electromagnetic induction
- #13 James Clerk Maxwell and the theory of electromagnetism

### *Challenges and Next Steps*

Going forward, the History of Science program faces at least four challenges. The first and most immediate concern is personnel since recent shifts within the organization have resulted in a smaller team. In order to maintain our desired pace of research, then, it will be necessary to employ additional investigators. We are currently reviewing potential timeframes for a prospective hire and considering the researcher skills and areas of interest that would most complement our existing strengths. We hope to begin searching for candidates soon.

The second challenge, of greatest interest in the intermediate term, has to do with the mechanisms in place for reviewing our studies and findings. Obtaining feedback from one’s peers is an essential step in producing scholarly work, but when working in a specialized domain such as the history of science it can

be difficult to find reviewers with both time and relevant expertise. To date, we have sought to address this challenge by a few means: circulating drafts for internal comment, contracting with paid external reviewers, and soliciting unremunerated feedback from academics and contacts within the wider Leverage network. For published manuscripts, anonymous reviewer comments have served as an additional source. Ideally, however, we would like to broaden our potential feedback base. We believe that some of this will come naturally as we expand and establish closer working relationships in academia, but we are also considering alternative systems of compensated review.

The third issue concerns how our findings should be disseminated and employed in the long term. In the past year, the institute's position has developed somewhat. In particular, we have come to the view that when a discovery helps to correct a particularly common misconception or has a good chance of facilitating others working in the area, it should be disseminated through conventional academic channels in addition to the Leverage Research website. In placing this year's publications, we have also gained a better sense of which outlets may be appropriate for future results. While clarity has been reached on academic engagement, however, uncertainties remain on the question of how and through which channels to engage other audiences of interest.

The fourth and final matter is one of the appropriate format for analytical studies. As we transition from individual cases to the level of patterns and generalizations, we may need to develop alternative modes of organizing and presenting our findings. Discussions of potential alternatives are currently underway, and we are hoping to arrive at a format by the end of the year.

## **Exploratory Psychology Research Program**

The institute's Exploratory Psychology research program aims to contribute to knowledge of human psychology through the dissemination and validation of novel introspective research methods and findings that arise from the use of those methods.

[Introspection](#), or the attempt to investigate one's thoughts, feelings, beliefs, and experiences through one's own awareness of them, has been used at various points in the history of psychological research, notably by Gustav Fechner, Wilhelm Wundt, and Edward Titchener in the eighteenth and early nineteenth centuries. The materials for this program come from the in-house research the institute conducted between 2012–and 2019, which involved thousands of hours of introspective work with hundreds of individuals.

Leverage Research is a non-traditional participant with respect to the modern field of psychology and disseminating research is often a challenge for outsiders, especially those with limited resources. As such, it was very important for us to take care in the selection of a strategy for communicating our previous research. Our primary goal for 2021 was to select such a strategy and then start taking steps to execute it.

The two main options we considered for the communication of our research were (1) publication of findings and research methods (e.g., on our website or in academic journals), and (2) distribution of research methods in practical form, enabling professional and non-professional researchers to conduct their own experiments.

In deciding between these options, it was part of our aim that our research methods and findings be incorporated into an external, publicly legible process of checking and confirmation by a sufficiently large number of researchers in a way that meets appropriate scientific standards. We took into account cost, the likelihood of success, and timelines.

Reflection on the nature of academic research and publication, combined with information we had [previously gathered](#) on the topic, led us to conclude that academic publication would likely succeed (initial publication efforts in our History of Science program have met with success) but might be a very slow and uncertain method of reaching wider dissemination if not supplemented by other approaches. We also concluded that publication on our website, while helpful, would be unlikely to issue in the degree of engagement necessary for thorough confirmation and uptake.

As a result, in Q3 2021, we decided on a dissemination strategy based around the distribution of our research methods in the form of an experimental “kit” or “starter pack,” designed to make it easy for researchers to conduct their own experiments. This strategy will likely be supplemented by publications on the topic of our exploratory psychology research, both on our website and in academic journals.

During Q3, we prepared a concrete proposal for the dissemination strategy. This strategy has not been formally adopted and was written prior to the allocation of a full-time program manager. It hence is subject to substantial change or revision. Nevertheless, for the sake of transparency and greater openness, we have decided to make the internal document containing the proposal available for review:

- [Exploratory Psychology - Release Plan - Q3 2021](#) — *internal document*

Concurrent with work on the dissemination strategy, we took initial steps to assemble explanations and materials pertaining to belief reporting, which was the first introspection tool we anticipated distributing. However, in Q4 2021, in response to public interest, we decided instead to prioritize making more information available about our previous psychology research program. We have now published a [general description and timeline](#) of the institute’s former psychology research on our website, covering the years 2012 to 2019, as well as a description of [intention research](#), which the institute explored in 2018 and 2019.

As a pleasant surprise, our developing expertise in the history of science has also proved useful in connection with communication about our psychology research. In early 2021, we briefly reviewed the history of introspection in preparation for a talk on bottlenecks in the field of psychology. More recently, we conducted an initial study on topics from the history of psychology, including muscle reading, suggestion, and ideomotor action as part of learning about and seeking to provide context for our intention research. This led us to produce a short piece on [muscle reading](#). We are excited to see what further opportunities develop pertaining to research in the history of psychology.

Kerry Vaughan is now leading the Exploratory Psychology program, which until recently did not have a dedicated program manager. Kerry joined the institute in 2019 and holds a Ph.D. in Philosophy from Rice University. Kerry will oversee the preparation of experimental materials for release, the development of a

research community that conducts exploratory research using those materials, and public engagement on the topic.

### ***Challenges and Next Steps***

In the coming year, the primary aim of the Exploratory Psychology program will be to help external researchers conduct introspective research in a public or semi-public setting using the research tools and methods developed previously at the institute. This will bring a variety of anticipated and unanticipated difficulties.

For instance, the results of introspection are often very personal in nature and researchers will often legitimately prefer to keep their data private. Yet, sufficient information must be shared with other researchers and the public to enable the relevant process of checking and validation to take place. The challenge here will be to create research and data-sharing norms that enable enough information to be shared with others while protecting the personal interests of researchers.

As a second example, one of the institute's key perspectives is that there is a stage in the development of successful sciences that comes before maturity; hence our focus on *early stage science*. The standards and practices that befit early stage science, we propose, differ from those proper to later stage science. One challenge will be to help researchers hold themselves and each other to appropriate standards, neither forgoing rigor altogether nor mistakenly applying standards derived from popular conceptions of late stage science.

Most importantly, however, it will be essential for us to communicate to researchers we collaborate with about the risks and dangers associated with introspection research. Through our research, we identified a number of potential deleterious effects from the use of introspective techniques and through our recent [inquiry](#) learned a lot more about further environmental risk factors. As part of helping others to engage in relevant research, we want to make sure they understand the risks and how to mitigate or reduce them.

To make it easier to meet these challenges successfully, we expect to start with smaller groups of researchers and expand slowly, working to build the relevant culture and systems to support the researchers as the research groups grow.

### **Bottlenecks in Science and Technology Program**

Our Bottlenecks in Science and Technology program, which we launched in 2021, is part of a planned wider initiative aimed at identifying and breaking bottlenecks to responsible progress across scientific and technological fields.

Historically, advances in science and technology have contributed substantially to global prosperity. Further advances promise to bring similar benefits. With public concern about scientific progress [slowing down](#), it is essential that resources be devoted to ensuring that progress in science and technology continues. At the same time, the history of science shows how the development of new science and

technology can lead to harm. It is thus equally essential that the progress humanity makes in science is done responsibly.

It is the thesis of our Bottlenecks in Science and Technology program that it is possible to make significant scientific and technological progress, and to do so responsibly, by thoughtfully identifying the bottlenecks to progress in each field and bringing together the people and resources needed to break those bottlenecks. We believe that this will work best if analyses (1) account for the social, institutional, and technical bottlenecks to progress, (2) cover multiple fields, including in the natural and social sciences, and (3) are performed in the context of discussions between researchers, institution designers, research program managers, and funders.

Breaking bottlenecks in science and technology is a challenging task and likely requires many groups to work together. Through our Bottlenecks in Science and Technology program, we hope to play an important role, helping to bring together relevant experts and funders, applying knowledge from our past and present research where useful, and when necessary contributing directly to specific projects. With respect to our research, our current focus on early stage science may prove useful if any bottlenecks result in part from a misunderstanding of the dynamics of early stage research, whereas our previous research may be important where knowledge of coordination or research program design would be valuable.

In late 2020, we began conversations with [José Luis Ricón](#) and [Adam Marblestone](#) about the possibility of co-organizing a workshop on the topic of bottlenecks in science and technology. In June 2021, we co-ran a workshop by that name at the Denver headquarters of supersonic aviation startup Boom Supersonic. The event featured presentations on bottlenecks in ten different areas in science and technology, including energy production, metagenomic sequencing, psychology, functional institutions, and life extension. Peter Thiel, Patrick Collison, and Tyler Cowen gave keynotes, and lightning talks covered topics such as building R&D in carbon capture and the importance of research program design. The goals of the workshop were to provide a context for researchers to conduct analyses of bottlenecks in different fields, develop bottleneck analysis as a format, acquire greater knowledge of bottlenecks in specific fields, and start to create a network of researchers, funders, and institution designers interested in these topics.

The event was held under Chatham House Rules to ensure that participants could speak candidly about the state of progress, and sometimes lack thereof, in their respective fields. Some presenters agreed to have lightly edited recordings of their talks made available; these can be viewed on the [Bottlenecks YouTube Channel](#) we created. Some presenters also wrote public essays related to their work such this piece on [next-generation geothermal](#) and this one on [bottlenecks in telerebotics](#). The workshop itself was described in a [post](#) by José Luis Ricón on his website.

The workshop was extremely well received by the 33 event attendees. In the post event survey, 80% of respondents rated the workshop a great use of their time and the event achieved a Net Promoter Score (NPS) of 87. The idea and initial funding for [Impetus Grants](#) (“Fast Grant”-style funding for longevity, which soon raised more than \$20 million) arose from a conversation at the workshop, a new Carbon Dioxide removal initiative ([Carbon Dioxide Removal \(CDR\) Imperative](#)) between Stripe and Carbon180

was catalyzed by people who met at the workshop, and the success of the event inspired [Prima Materia](#) to run an informal “BottlenecksX”-style event in London (“Bottlenecks: London”) to start conversations about breaking bottlenecks in science and technology in Europe. You can read our write-up of the workshop [here](#).



Following the success of the workshop, Leverage Research was awarded a \$50,000 [Emergent Ventures Grant](#) to continue our Bottlenecks work. We developed the idea for an expanded Bottlenecks Initiative, officially launched the institute’s Bottlenecks in Science and Technology program (counting the Bottlenecks workshop as the inaugural event), and began exploring collaborations with other organizations interested in co-organizing further workshops with us. We also began organizing researchers from the original workshop to write up more formal analyses of bottlenecks in different fields to be published together, and started initial research on biosecurity as part of a potential collaboration in that area.

We paused our Bottlenecks work in October 2021, following a [public account](#) by a former colleague in our pre-2019 research collaboration about her negative experiences with the project from 2017 to 2019. After taking time to better understand people’s experiences with our earlier research collaboration and learn what [lessons](#) we could to improve our current work, we took steps to unpause our Bottlenecks program.

## *Challenges and Next Steps*

For 2022, our main priorities for the Bottlenecks program are to hold a second Bottlenecks workshop (“Bottlenecks 2022”), reconnect with partner organizations about the events we put on hold last year, and finalize the format and funding for the bottleneck analyses we planned to have written and published last year.

We have received strong indications of interest in our Bottlenecks 2022 workshop and will aim to hold it in the late summer or fall.

The main challenges for our Bottlenecks in Science and Technology program pertain to refining the format for bottleneck analyses, identifying the right mix of people and projects to bring together at events, and setting up conditions so as to align incentives between donors and researchers. We also expect to need to learn how to fit ourselves into the landscape of organizations working on these topics in a way that encourages collaboration and synergy.



## **Research Fellows Program**

The institute’s Research Fellows program is intended to encourage early stage research by offering funding and other support to researchers conducting promising research in new or underdeveloped fields.

After the successful launch of our Bottlenecks in Science and Technology program, we judged that we had inadequate organizational capacity to support a cohort of research fellows in the foreseeable future. As a result, in Q1 2022 we made the decision to put the Research Fellows program on indefinite pause.

We continue to value supporting researchers working in nascent fields and hope to have the opportunity to unpaue this program in the future.



## Engagement

Public communication and engagement continue to be a high priority for the institute. Over the last year, we have been working to provide an accessible explanation of our past and present work, build alliances with external researchers, and expand our engagement with audiences interested in the future of science.

Additional interest in, and questions about, our work towards the end of 2021 caused us to expand our engagement efforts, explaining more about our previous work and attempting to communicate through a variety of different mediums.

## Sharing Our Work

### *Current Work and Programs*

To share work from our current programs, we continue to publish our history of science case studies on our [website](#) along with research highlights pieces summarizing the key insights to make findings from our research more accessible. We created a [new page](#) on our website explaining more about our Exploratory Psychology program and our Executive Director gave two talks about our previous psychology research; a talk that touched on our introspection research at Bottlenecks 2021 and a talk on our intention research at [Hereticon](#). With respect to our Bottlenecks program, we worked with Protocol Labs to create lightly edited videos of some of the presentations from the workshop, which can now be found on the Bottlenecks [YouTube channel](#).

Links to and descriptions of this work, along with other updates, are shared in our quarterly newsletter ([subscribe](#) or [read past newsletters](#)) and on [Twitter](#).

We also worked on a new design and content for our website, including an FAQ, research archive, and more information about all of our programs. Unfortunately, we were not able to complete this in the timeframe originally envisioned, partially because it involved more work than we originally anticipated and partially because our priorities shifted. We expect to complete the website redesign with the new content over the coming months.

### *Past Research*

Alongside our current research programs, Leverage Research continues to publish reports summarizing areas of our past research, including sharing previously unpublished notes and research documents. In 2021, we shared three new research reports, two on consensus research and one on the topic of intelligence amplification.

1. [Intellectual Practice Examination](#) describes Leverage Research's investigation in early 2013 into whether having individuals identify and share descriptions of their intellectual practices can help a group more effectively reach consensus while avoiding the pitfalls of [argument mapping](#), which had previously been studied. Through this research, Leverage found that it was possible to identify

- and catalog a large number of intellectual practices but that individuals employed too many to navigate methodically to reach consensus.
2. [Enhanced Discourse Norms: Intellectual Processes](#) describes a different approach to consensus Leverage Research explored in late 2013 and early 2014 after previous approaches had failed. Here, participants would supplement existing discourse norms with the option to discuss the intellectual processes they were each using in order to reach their views, such as noting that one had reached a particular conclusion by running a mental simulation or briefly trying and failing to think of alternatives. This approach was deemed useful, though not sufficient on its own to produce the magnitude of effect sought.
  3. [Intelligence Amplification Map](#) contains a literature review of methods of human cognitive enhancement and intelligence amplification conducted in 2011.

All of these research reports can currently be found on our [Executive Director's website](#). They will be moved to the Leverage Research website when enough of them have been produced and there is a suitable place on the website for them.

## **Audience Engagement**

To expand our engagement with audiences interested in the future of science, we did more podcast interviews over the last year and also attended and spoke at several events.

With respect to podcasts, our Executive Director discussed technological breakthroughs and how the history of science can help us understand research programs today on the [AI Tomorrow podcast](#); building solid foundations for knowledge on the [Futurati podcast](#); and bottlenecks in science, knowledge acquisition and decay, and Leverage's work more generally on the [Narratives Podcast](#). Kerry Vaughan (who at the time led our History of Science program) spoke about the history of electricity and the importance of responsible science on [The Knowledge Archive podcast](#) and about responsible research and narratives around science on the [Futurati podcast](#).

For conferences, aside from Bottlenecks 2021 and Hereticon, mentioned above, some of our staff attended the [Metascience 2021 Conference](#) and the Progress Studies Strategy Summit.

## ***First Public Fundraiser***

Starting on Giving Tuesday in November, we ran our first public fundraiser. The fundraiser provided us with an opportunity to reach out to our existing supporters and meet potential new ones. As we were now working within the limits of our new Donor Policy with maximum annual donations of \$50,000 per organization and \$10,000 per individual (see below for more details), we needed to make sure that our work was accessible and our mission compelling to a broader audience than ever before.

We completed the fundraiser successfully, raising \$103,400 (compared to an initial target of \$100,000), all from individual donors and with more than half of the total coming from new donors. Leverage Research

is incredibly grateful to everyone who donated and we expect to run more public fundraisers like this in the future.



## Answering Questions and Addressing Concerns

The last quarter of 2021 generated a lot of additional interest in our work, particularly our 2011 to 2019 research collaboration (“Leverage 1.0”), which means we devoted extra time over the last six months to answering questions about our work.

Part of this interest stemmed from the reignition of old rivalries with individuals (including, unfortunately, some community leaders) in an online community known as the Rationality or LessWrong community after we received a grant from Emergent Ventures. We discuss some of this in the *Conflict and Community Relations* section of our [November 2021 Executive Director Letter](#).

More importantly, there was also understandable interest, questions, and concern about our pre-2019 research collaboration after a former colleague, Zoe, [wrote about](#) her negative experiences working on the project. While these events happened around the same time, we felt it was important to try to separate the historical conflicts from the legitimate concerns about mistakes we had made in the past given the terrible experiences Zoe described.

Leverage Research launched an inquiry into former colleagues’ experiences and reached out to them to offer support such as funding towards therapy. We discuss this at greater length in the section below on Institute Responsibility as understanding people’s experiences and mistakes we had made was an important focus for the institute and improving our future work.

To try to help more people understand our work, our history and to answer any questions people might have, we ran two open Ask Me Anything (AMA) events at our virtual office, posted a [questions and feedback form](#) on our website, and our Executive Director hosted a couple of live discussions about our history on his [Twitch channel](#), including a conversation with a longtime leader of the LessWrong/Rationality community, the recording of which can be found [here](#).

We supplemented these endeavors with projects to communicate about our research such as the intention research piece and new exploratory psychology page. Separately, two additional former staff members ([Jonathan](#) and [Cathleen](#)) wrote about their own experiences with our previous research project in December, adding new perspectives and greater depth to the public picture.

## **Engagement Challenges and Next Steps**

With respect to public engagement, the most immediate challenge the institute faces is finding ways to encourage constructive and respectful discourse among well-intentioned audiences, even critical ones, while at the same time discouraging interaction from disingenuous or ill-intentioned interlocutors. This is especially difficult on the internet, where well-meaning and noxious interactions frequently occur in the same space and are difficult to separate.

Nonetheless, this challenge is crucial to try to address as not listening to legitimate concerns, allowing the spread of misinformation, and tolerating bad behavior online can all cause harm in different ways, not just to our work but also to our current and former staff, as we discuss in our [inquiry report](#).

We expect to approach these issues thoughtfully, experimenting with different approaches and seeking further discussion with critical but respectful interlocutors until satisfactory solutions can be found.

## **Institute**

In this section, we discuss our activities related to developing and running the institute over the past year with respect to strategy, internal development, responsibility, operations, and finances. Notably, we deprioritized hiring, prioritized actions related to institute development and responsibility, and partially revised our strategy for research dissemination after a former teammate wrote publicly about her negative experiences in our pre-2019 research collaboration.

## **Strategy**

Since its inception, Leverage Research has sought to develop a strategic picture of relevant parts of the world as part of identifying opportunities for outsized impact. This picture has evolved as the institute's understanding has grown and as the world has changed. Previously, Leverage's strategic picture was held privately; now, as part of our efforts towards greater transparency, the institute is endeavoring to make its strategic picture public.

The centerpiece of our present approach centers on *early stage science*. For a variety of reasons, this has become a neglected area. This is surprising, as the development of new scientific fields is an important determiner of the direction of technological development, and science itself is a central contributor to the modern educated perspective.

Further information about our strategic picture will be made available, with the institute currently planning events on the topic in 2022 that will be open to the public.

Over the past year, the institute has made two important adjustments to its picture. The first centers on the theme of *responsible science*. Reflection on the pandemic and gain-of-function research, initial research on the history of institutional review boards (IRBs), and our continuing awareness of the potential danger of artificial general intelligence led us to identify responsibility in science as a potential under-examined topic.

The second update pertains to the ease of communicating responsibly about the [intention research](#) we conducted as part of our psychology research in 2018 and 2019. This is a challenging research area that comes with what we believe are important risks, and it can be difficult to communicate about both the area and the risks simultaneously. We had thus planned to publish information about this research after we had released the psychology research we had conducted from 2012 to 2017 as background. However, after former team members posted publicly about experiences that related in some ways to our intention research, we revisited the question of whether there might be some way to communicate about this research to help give context to those experiences. We found, to our surprise, useful historical precedent for intention research as well as greater public receptivity and interest than we had expected. It thus seemed easier to communicate responsibly about this topic. In light of this, we changed our plans for the release of this research.

As noted, over the following year the institute expects to take further steps to communicate about its strategic views to the public. We expect this will spark constructive and fruitful conversation.

## **Responsibility**

In October 2021, a former colleague, Zoe, [wrote about](#) her negative experiences as part of the research collaboration we led from 2011 to 2019 before Leverage Research restructured in 2019 to focus on early stage science. Her account focused on the work environment and our previous psychology research.

As an initial response, our Executive Director [wrote a public letter](#) which, amongst other things, publicly apologized to Zoe, offered support to members of the collaboration in the form of reimbursement for therapy expenses, and encouraged others to share their experiences with Leverage 1.0.

In order to better understand the circumstances Zoe described, we also launched an internal inquiry led by a long-time advisor to investigate the experiences of our former colleagues and what we might learn from them. We felt it was important to understand and take responsibility for ways our past failings and shortcomings might have negatively impacted those we employed or collaborated with.

Adding to Zoe's account, two former team members, [Jonathan](#) and [Cathleen](#), wrote publicly to share their own perspectives of their time as part of our previous research project. The inquiry tried to take these into account as well, though they were published later so not all interviewees had a chance to respond to them.

The inquiry wrapped up earlier this year having spoken with everyone who wished to be interviewed (slightly more than a third of those contacted) and we spent time reflecting on the lessons we could learn from the experiences of interviewees and those described in the public accounts. Overall we found that, although those interviewed did not agree with the characterization of Leverage 1.0 given in the first public account and the majority had an overall positive experience with Leverage 1.0, it was likely that some people did have very negative experiences that were in some ways akin to what Zoe described. We recently published a [public report](#) on the findings of the inquiry, the lessons we have learned from it, and our reflections on some of the important mistakes we made as an organization during that time.

## **Development**

Over the past year, we sought to continue defining the institute internally and hire for key roles. This continues the institute development efforts we began in mid-2019, after the dissolution of our previous research project.

## ***Policies and Values***

Part of the process of defining the organization internally involves adopting key policies and articulating institute values. Especially over the last two quarters, we have adopted a number of policies and begun the process of articulating our values.

Earlier in the year, one of our researchers spent time conducting research into the history of the creation of Institutional Review Boards (IRBs) as part of thinking about responsible science and how to support scientific advances responsibly as an institute. We paused this work to instead write an introduction to the [intention research](#) Leverage conducted in 2018 and 2019, but hope to return to work on responsible science in 2022.

With respect to policies, Leverage Research has now adopted a Donor Policy, an Affiliate Responsibility Policy, and a Conflict of Interest Policy. Each of these is meant to provide internal guidance as well as legibility to external parties, thereby aiding in the institute's efforts at transparency.

Our Donor Policy limits the amount of funding the institute is willing to accept from individual and organizational donors each year (\$10,000 and \$50,000, respectively), except in exceptional circumstances where, for example, we believe the donor is strongly aligned with our vision for our work. We expect this policy to incentivize us to build a broader base of support than we have previously and to keep the size of the institute in step with the public's understanding of our work.

Our Affiliate Responsibility Policy is meant to describe our responsibility for the actions of our affiliates. The Conflict of Interest Policy is meant to help us make fair and reasonable decisions in circumstances where personal interests might impact decision-making.

Further, the institute has also begun experimenting with policies designed to increase employee freedom, flexibility, and productivity. In particular, early in the year, we began setting quarterly goals in a style akin

to [Objectives and Key Results \(OKRs\)](#) for individuals and areas of the institute’s work. In Q4 2021, we began experimenting with “Google 20% time,” i.e., letting employees spend 20% of their time on activities of their own choosing aimed at either professional development or helping with their work in some way that falls outside of their regular duties. This experiment was successful enough that in Q1 2022 we have provisionally adopted “Google 20% time” as a standing institute policy.

With respect to values, we believe that the values of an organization can aid decision-making in complex circumstances and can help foster a shared and mutually transparent culture. In team conversations, we have taken the first steps to identifying central values. Values we have discussed and found particularly promising so far pertain to leading by example and taking responsibility. We expect to identify further values over time.

## *Staffing*

During the past year, some individuals’ roles changed as we clarified institute priorities. In particular, Kerry Vaughan became Program Manager for the Exploratory Psychology program and Evan Pence was promoted to Program Manager for the History of Science program.

We originally had intended to make new hires in 2021, both for an events and operations role and for a history of science research role, however, these plans were postponed in favor of a focus on public engagement and support in October 2021.

## *Operations*

Over the past year, Leverage Research took over all of its own operations. Previously, some of the institute’s operations were still being run by [Paradigm](#), which was helping to incubate it.<sup>2</sup>

## Finances

### *2021 Projected vs Actual Spending*

In our [last annual report](#) we projected that our base costs for 2021 would be **\$270,000** assuming no increase in headcount, that we continued to operate remotely, and that we would not run a new cohort of Research Fellows given COVID-19 restrictions. These projections did not include funding related to the Bottlenecks in Science and Technology project as, at the time, the project was too early in its development to make reasonable estimates and we already had tentative commitments to fund it separately.

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<sup>2</sup> Paradigm is a for-profit coaching, training, and incubation startup that was founded by some of the early Leverage 1.0 team in late 2015. Paradigm (at the time called “Paradigm Academy”) was then part of the Leverage 1.0 research collaboration until Leverage 1.0 ended. It may seem unusual that Paradigm, which came out of Leverage 1.0, would then incubate Leverage 2.0, but this was in fact what happened.

Our actual spending in 2021 was **\$240,000**. This is primarily because we had fewer staff than we had projected but spent slightly more than anticipated on administrative costs like accounting. This does not include the **\$65,000** we spent on activities related to our Bottlenecks Program in 2021.

## **Challenges and Next Steps**

The primary challenge for the institute with respect to its overall operations in 2022 pertains to hiring; a second pertains to prioritization in the face of surprising or unanticipated events.

With respect to hiring, we now have several positions for which we might want to hire and areas where we need to increase capacity. For more on this, see our hiring plans for 2022 below.

Regarding prioritization, one difficulty we faced during 2021 was understanding how to modify our previously existing plans and quarterly goals in response to unanticipated events. We imagine this is a persistent challenge for organizations, especially difficult when new events call for an immediate response. Our hope is that we will learn how to navigate this better over time, both from our own experiences and the experiences of others.

## **Plans for 2022**

Leverage Research will continue to pursue its mission throughout the remainder of 2022 by advancing its programs, making new hires, and expanding its public engagement efforts. We have covered many of the expected challenges in the preceding sections; in this part of the report, we will briefly summarize our plans for the year, state our budget projections, and describe how to keep in touch and support our work.

## **Programs**

For our History of Science program, we expect to complete at least two case studies in the history of electricity, the first of which is currently underway and covers the discovery of electric light and fire. Having thus covered what we estimate to be half of the important discoveries and advances in the early history of electricity, we will be positioned to produce an interim report on our findings.

Through our Exploratory Psychology program, we expect to begin releasing information about our in-house research tools and methods in a way that puts professional and non-professional researchers in a position to replicate our findings and do their own experiments. We expect the shape of our efforts to be importantly informed by our understanding of early stage science, including from case studies from our History of Science program.

Our Bottlenecks in Science and Technology program will resume with new events (including Bottlenecks 2022), efforts to produce reports on bottlenecks in different areas in science and technology, and ideally the eventual launch of a larger, multi-organization initiative on the topic. We expect our choices for which



events to run and which activities to organize will depend importantly on the input of organizations and individuals working in relevant areas.

## Responsible Philanthropy

Leverage Research has long had an interest in the philosophy of philanthropy, seeking to identify the most effective avenues for positive impact, learning how to assess projects' likelihood of success, and engaging with individuals and groups with an interest in improving the world, such as with our early involvement in the [Effective Altruism](#) movement. More recently, the institute's perspective has been also shaped by its recent restructuring, where it has taken steps in the direction of becoming a more traditional non-profit.

Recent conversations with other non-profits as well as donors has suggested the possibility of a need for future work in this area. Time permitting, we may devote some institute resources to hosting discussions on the topic, researching the history of philanthropic efforts, or taking steps towards the articulation of a new philosophy of philanthropy. A number of factors indicate that the concept of responsibility may be a key theme in work in this area.

## Hiring

Among our highest priorities for 2022 will be advertising for and filling a number of positions to boost capacity across our programs. Roles we are interested in finding suitable candidates for include:

- History of Science program, Researcher (likely full-time)
- Bottlenecks in Science and Technology program, Events (at least part-time)
- Bottlenecks in Science and Technology, Program Managers (at least part-time)
- Research Assistant for the Executive Director (likely full-time)
- Institute Operations (at least part-time)
- Communications Specialist (at least part-time)

Many of these roles might potentially be combined in different ways depending on the candidates and over the coming months we will prioritize defining possible roles and requirements. The highest priority of these are a History of Science Researcher and roles in Operations and Event Management.

Please direct all inquiries to [contact@leverageresearch.org](mailto:contact@leverageresearch.org) and see our [website](#), [Twitter](#), or [newsletter](#) for further announcements.

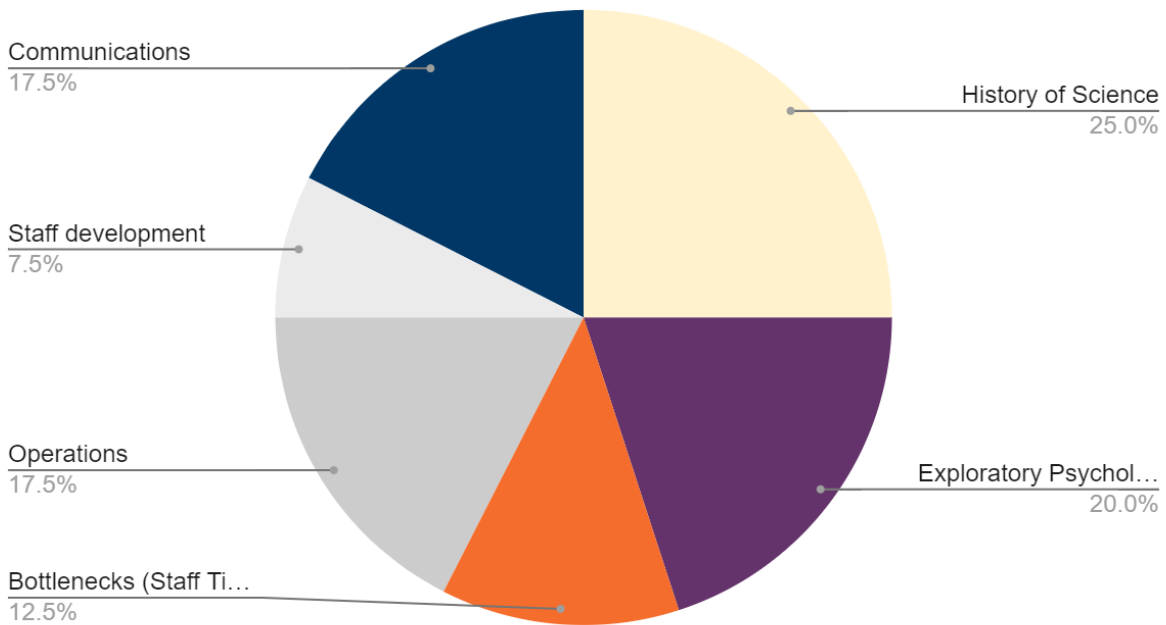
## 2022 Budget Projections

### *Base Costs: \$440,000*

Having completed a successful Winter Fundraiser at the end of 2021, we have increased the base budget we shared as part of that fundraiser to include two new hires occurring halfway through the year, small pay increases for all of our staff, and starting to set aside more runway.

Our resulting baseline budget projection for 2021 is approximately \$440,000, broken down approximately as follows:

### 2022 Base Budget



This projection assumes that (1) we increase our headcount from four to six full-time staff halfway through 2022 with that new headcount divided between History of Science, Operations, and Bottlenecks (Events), (2) we continue to work remotely this year, and (3) that we fundraise for Bottlenecks 2022 and other activities within our Bottlenecks Program separately. Not included within this pie chart, but captured as part of the base budget is setting aside \$55,000 as runway.

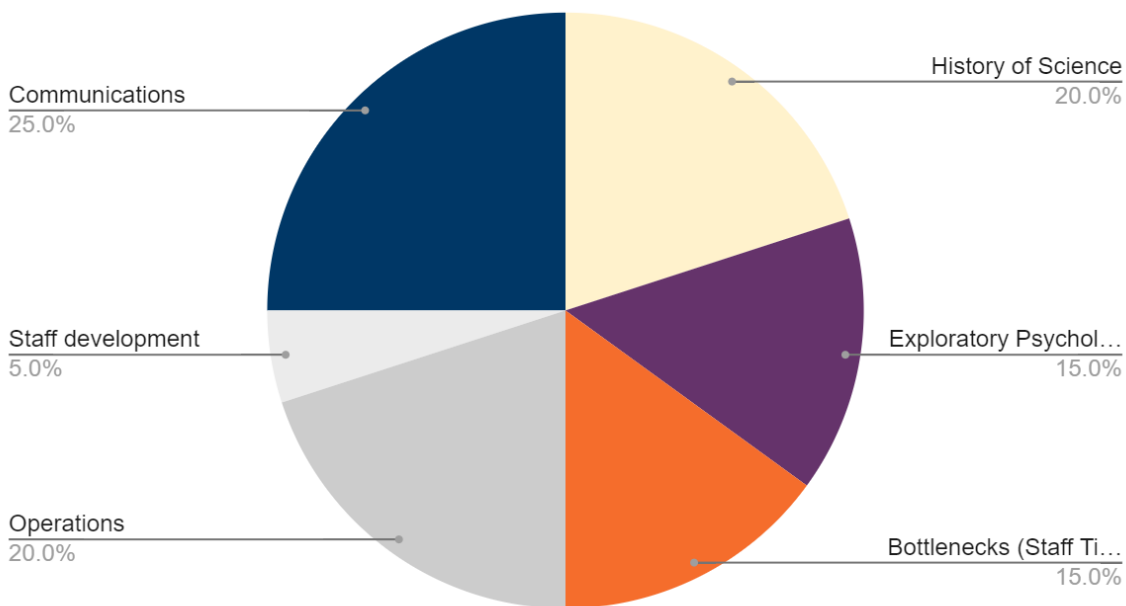
The split between our programs is slightly different than the projections given during our [Winter Fundraiser](#) as we have subsequently allocated a program manager to the Exploratory Psychology program.

**Expanded Budget: \$620,000**

If we are able to raise additional funding, we expect to get an in-person office, and make additional hires, such as a Program Manager for our Bottlenecks program, a Research Assistant for our Executive Director, and adding further capacity in events, communications, and operations. We may also spend small additional amounts on contractors, software, and other items that would support our work.

Our spending in this scenario would be broken down across our programs and other areas approximately as follows:

**2022 Expanded Budget**



In this scenario, we would aim to set aside approximately \$105,000 in runway to give greater stability to, what would at this point be, our six full-time staff.

In both scenarios, we expect to separately raise approximately \$75,000 for Bottlenecks 2022 and additional funding to support researchers writing bottleneck analyses.

**Support Our Work**

There are many ways to get involved or support our work: donate to support our programs, read our research, learn about the institute’s history, or reach out directly. We continue to face serious challenges and the support we receive meaningfully improves our chances of success.

## Donate

Leverage Research is supported by donations from organizations and individuals who believe in us and share our mission of bringing greater prosperity through responsible scientific advance. Apart from exceptional cases, we accept a maximum of \$50,000 per year from organizations and \$10,000 per year from individuals. We accept donations via [PayPal](#) and also accept [cryptocurrency](#). See our [donation page](#) for other ways to donate or reach out to us at [contact@leverageresearch.org](mailto:contact@leverageresearch.org).

## Learn More

Over time we are making more information available about the institute and its past and present work. To learn more about our research, read our [case studies](#) in the history of science, see an overview of our [previous psychology research](#), or read about our [intention research](#).

With respect to the institute itself, for our more recent history see our [Annual Report 2019-2020](#), [2021 year in review](#) message from our Executive Director, and this report. For our earlier history, 2011-2019, we recommend reading [Jonathan's](#) and especially [Cathleen's](#) accounts of their experiences, and also [Zoe's](#) with the context offered by our [inquiry report](#) on the topic. We plan to communicate more about our earlier history in the coming months and years.

## Contact Us

For inquiries pertaining to the institute or anything discussed in this annual review, please contact us at [contact@leverageresearch.org](mailto:contact@leverageresearch.org), come to one of our AMAs, or connect with us on [Twitter](#).