

The Success of Failure: Perspectives from the Arts, Sciences, Humanities, Education, and Law

DECEMBER 7, 2017 - DAY 1

Session 1: Failures in Science from the Perspective of History

[Harry Collins](#) (Social Sciences, Cardiff University) traced the first attempts to detect gravitational waves, which are disturbances in the curvature of space-time caused by the merging of two black holes. Beginning with Joseph Weber's 1959 experiments, gravitational waves were finally detected in September 2015 by Rainer Weiss, Barry Barish and Kip Thorne, earning them the 2017 Nobel Prize in Physics. While Weber believed that he had discovered gravitational waves as early as 1969, his findings were dismissed by the scientific community who found the evidence inconclusive. By the mid-1990s, Weber's credibility had suffered greatly. Yet over time, the technology gradually improved, culminating in the European Space Agency's Laser Interferometer Space Antenna program for a planned 2034 mission which relies heavily on Weber's contributions. Without Weber's persistence in the face of professional cost, other physicists likely would have overlooked the high frequency waves.

Are failures just errors that haven't (yet) sparked discernible progress? [David Kaiser](#) (History of Science and Physics, Massachusetts Institute of Technology) outlined the typologies of scientific failure by discussing their histories, merits, and hindrances to scholarly work. He argued that despite technological advances, academia had been hindered by the sheer amount of information being produced. While the rate of scholarly publication grew over the past 40 years, readership and citation distribution decreased. 47% of the nearly 800,000 scientific articles published in 1981 have never been cited, even by their own authors. David Kaiser suggested the popular maxim 'publish or perish' could be rendered 'publish *and* perish' to reflect that high volumes of academic publication did not always mean better scholarship.

David Kaiser argued the over-interpretation of unreliable evidence allowed prolonged experimental failures to be seen as successes. For scientists working in new frontiers, results are expensive and replication was difficult (Joseph Weber's 'failed' attempts cost approximately \$1 billion). Such "wishful thinking" resulted in errors often exacerbated by competition. Many of physicist Jan Hendrik Schön's publications were retracted when it emerged he'd falsified data to make fantastic claims. Despite passing peer review, Schön harnessed the process designed for error prevention to sharpen and 'perfect' fraudulent results. Reception of Schön's false data was insufficiently critical because he had deliberately produced outcomes the scientific community hoped and *expected* to find. However, Albert Einstein refused to engage with research contradictory to his own positions, he was eventually proven right on many of these debates. Finally, David Kaiser discussed physicist Enrico Fermi, whose supposed discovery of two new elements was revealed to be in error only after he won the Nobel Prize. Fermi's work was clearly flawed, but only recognized in hindsight. Nonetheless, these efforts played important roles in the generation of knowledge. David Kaiser suggested a need to reconsider the functional nature of failure in science, so productive *successes* might emerge in retrospect.

Scientists, particularly those in their early career, often associate errors with personal failures. As [Jutta Schickore](#) (History of Science, Indiana University Bloomington) noted, cultural tropes show multiple defeats as a requirement for eventual triumph. She described Ernst Hallier's 19th century study of bacteriology. While his experiments were methodologically sound, technological deficits limited his successes. In fact, biologists were only recently able to achieve his attempted results. Jutta Schickore underscored the need to distinguish between the elements of failures, including those functioning as

motivation for others. Hallier's discredited work inspired early wound infection studies. Failures should be measured by tools and knowledge systems of the day, not just the results.

Responses

The relationship between the personal and collective in science challenges the perceived virtue of mistakes. The professional martyrdom of those who publicly failed while advancing the pursuit of knowledge creates an ethical and social dilemma. [Catherine Chase](#) (Cognitive Studies, Teachers College, Columbia University) found that scientific breakthroughs were often built on failures. She argued for a broader definition of error, where scientists avoided *bad* failures and expanded on productive mistakes. "Failureology" - identifying knowledge gaps as a means of learning what we do and don't know - would be a positive step for ensuring future successes. However, it would be an inherently retrospective discipline where insights are can only be realized in hindsight.

[Jonathan Weiner](#) (Medical and Scientific Journalism, Columbia University) approached the question from a journalistic perspective, a profession often preoccupied with failure; coverage of the 1989 Exxon Valdez oil spill exemplified the industry's negativity at the expense of positive stories. He asked how journalists could communicate the *process* of science better, moving beyond the current incentives to celebrate achieved aims, whether warranted or not. In fact, scientists' inability to properly communicate can cause real triumphs to be perceived as defeats.

Quoting physicist Max Planck's assertion that "science advances one funeral at a time," Harry Collins referred again to Joseph Weber and Ernst Hallier, who stuck to their beliefs in the face of criticism, a strategy with positive effects and drawbacks. Echoing Jonathan Weiner's point that science in the popular press focuses on results not methods, Collins suggested inquiry-based learning does not adequately teach "getting things to work." Creating scientifically literate students who understand the relationships between the outcome and its creation would help overcome the simplistic view of science, allowing the public to see the field as historians, sociologists and philosophers of science do.

The panelists discussed how social dynamics in scientific and broader intellectual communities help determine what work is produced. Racing towards results can create competition, while complicating data sharing; there are often as many barriers to effective collaboration as there are incentives. Errors should be viewed as part of the *process* of science and inherently productive, even if they don't provide clear directional ideas. The National Science Foundation's definition of [basic science](#) as research "performed without thought of practical ends" which nonetheless results in new knowledge and understanding allows for failures. Creating an information hierarchy limits intellectual possibilities and unanticipated discoveries. Whereas in business, the stigma and possibility of failure can be paralyzing factor, the panelists referred to design thinking principles of "fail big, fail early, fail often" as a guide for learning from mistakes as a process for *testing* failure. Yet they noted the ramifications of error is dependent on one's career stage. For junior scholars and faculty, mistakes are a greater risk to professional advancement. Whereas undergraduate students have ample opportunity for failure and experimentation, graduate students face increasing pressure to avoid error at all costs. While failure (over time) reaps benefits for the intellectual community at large, it does not always help individuals who fall short and are publicly criticized for doing so.

Session 2: Failures of Social Regulation

[Tim Wu](#) (Law, Columbia University) focused on failure to regulate lawbreaking. While crime is viewed as a breakdown of legal regimes, it can have a positive meaning when laws are seen as unjust. Civil

disobedience (against racial segregation, for example) has a different moral value than violent crime. While online fantasy sports leagues are technically prohibited in New York State, they thrive by subverting gambling prohibitions often seen by the public as illogical and outdated. What was once considered a social taboo and a legal offence is generally viewed as a harmless vice. Yet these leagues are now indistinguishable from regular gambling. This regulatory breakdown questions generational sovereignty: do people consent to laws out of belief or to avoid punishment? Unpacking the concept of lawbreaking helps illuminate the evolution of legislation and the limits of democratic governance.

[Alondra Nelson](#) (Sociology, Columbia University) discussed the Trump Administration's changes to the Office of Science and Technology Policy (OSTP) as staffers departed en masse and the website disabled. The Obama Administration believed "science touches everything" and recognized its long-term benefits for legal, ethical, and social legislation. While the Science Advisor held a cabinet-level seat with a broad mandate, today's OSTP does not play even a minor role in scientific policy. Alondra Nelson spoke of Vannevar Bush, director of the defunct Office of Scientific Research and Development during World War II, who advocated for increased research including the Manhattan Project and the National Science Foundation. In contrast, current OSTP employs fewer than 40 staffer with no director, public outreach, or discernible strategy. Meanwhile, reports are wiped from the Environmental Protection Agency's website, signaling the diminished value of facts. Alondra Nelson argues the Trump Administration's OSTP shows the failure of failure - the loss of science for democracy, accountability and liberty.

[Carl Hart](#) (Psychology, Columbia University) described failures in the development of medication and treatment for drug addiction by outlining the negative consequences of bias surrounding recreational use, including the popular beliefs created by science research. American drug policy has historically *not* been based on pharmacology, but sociopolitical factors like race and class. This failure to adequately connect facts and procedure led to illogical and often unsuccessful laws. The different treatment of drugs and firearms displays the irregularity and tension of legislation designed to benefit society, while simultaneously protecting citizens from an overbearing state. The 2nd Amendment protects the rights to own and use lethal weapons, which starkly contrasts harsh policies prohibiting recreational drugs. Carl Hart argued the failure to fix substance problems has little to do with the narcotics themselves, but the absence of economic opportunities that fuel drug sales and subjugation of the communities themselves.

Responses

[Katharina Pistor](#) (Law, Columbia University) described the function of law, policy, and collective expectations for the future. She echoes critiques about relying on existing legislation to reflect society, which often results in disconnects between the law and the public will. At what point should statutes be changed, instead of building on failed legislation? As technological expansion places increasing strain on regimes of legality it also exposes the law's limits and ambiguities. Tim Wu explores the challenges of regulating online platforms like AirBnB, a task made increasingly complicated as sites move into legal grey areas. Do laws have an obligation to represent the will of the public, particularly the protection of the minority in a majority system?

Alondra Nelson arguing for the potential positive effects of a big-data moonshot. How might this attempt to shape science and technology policy be transformative? Harry Collins and Carl Hart debated the relative risks to democracy from the devaluation of science or deeper socio-political factors affecting communities. The battle for information control on the internet requires public audiences act as critical consumers. How is science research itself shaped by race, class, and political regimes that exploit science to suit their agendas? "Alternative facts" have power of science as an issue like climate change - once a

matter of consensus - has again become a matter for debate. The overlap between the norms of science and democracy pose fundamental questions about what science represents and dynamics of truth.

While the first panel demonstrated how scientific “failures” and “successes” were vindicated or negated in hindsight, the second panel explored if and how reason is embedded in legal and social policy. How are regimes of recognition premised on contested notions of scientific truth? Carl Hart argued science has provided an alibi for “social failures” in the service of questionable political goals, based on group panic and populist appeal rather than robust research and reliable data. The cultural history of narcotics shows how legislation can be racialized and enacted with dubious rationale. The negative effects of a prolonged War on Drugs demonstrates how research and government are deeply intertwined, for better or worse.

Session 3: Failures in Publishing and Negative Results

[John Spiro](#) (Simons Foundation Autism Research Initiative) addressed successes in scientific publishing and grant making, arguing progress depends on “failure-to-replicate” studies, which show the inability to repeat an experiment's results under the same conditions. But pieces are few and far between as time constraints, low professional motivation, and reluctance to refute a colleague's work create a bias against these reports. John Spiro noted that while a level of scientific knowledge exists in academic literature, an additional unofficial sphere of is formed in research-producing communities. These planes have different standards for determining data replication and the necessity of continued testing. In this context, John Spiro highlighted the value of “pre-prints” sites - repositories for completed articles yet to be peer reviewed - as a means for sharing research. While pieces published here do not circulate on the official level, they are vital for studying methodology, even if the results are ultimately unsuccessful. Moreover, these articles do not have to meet esteemed publications’ criteria of novelty, scientific efficiency, or offer groundbreaking results. Fostering a culture of publishing results regardless of outcome would increase dialogue and visibility of processes and methodologies, even in failure.

[Jonathan Weiner](#) (Medical and Scientific Journalism; Columbia University) began with a Virginia Woolf quote, “Words have very little natural gift for being useful.” Indeed, the best writers are those who recognize their inherent failure to coherently express themselves. He suggests scientific writing separate into two categories: stories of triumph or failures from people on the fringes who had not moved center. The difficulties in changing this narrative - echoing Thomas Kuhn’s “essential tension” between the status quo and exploration - suggests it is harder to write about rejected research than about successes.

Responses

[Peter Norvig’s](#) (Google) response drew on his computing expertise and early days at Google, where the need to understand user demands required programmers who could communicate with the social scientists exploring consumer experiences. [Jutta Schikore](#) (History of Science, Indiana University Bloomington) noted 18th- and early-19th- century science writings vividly portrayed failures and method. She argues it was only as mass academic publishing and the resulting standardization emerged that writers began to focus only novel, innovative, and “useful” research. Innovations like the Open Science Movement and the Journal of Visualized Experiments (a peer-reviewed scientific journal in video format) are crucial in increasing transparency of the scientific process. Ensuring public access to scientific data is vital for improved communication. To what extent could the dual level of scientific knowledge be expanded to produce “extended cuts” or results which reveal mistakes, outtakes, dead ends, and anomalies typically omitted from official publications?

Session 4: The Importance of Teaching Failure in Education

[Xiaodong Lin](#) (Cognitive Studies, Teachers College, Columbia University) argued that while failure is a universal experience, students are often unprepared to handle their errors. Failure is used to measure abilities, rather than as a learning tool. The cultural association of STEM “geniuses” (Albert Einstein, Marie Curie...) makes these careers appear untouchable. However, many scientific strategies employed by these “geniuses” offer a nuanced picture of scientists, minimizing the failure stigma. Xiaodong Lin used students’ engagements with famous scientists’ “struggle narratives” to explore this phenomenon. She found that students who learned about Einstein's struggle reformulated failure as a normal part of intellectual pursuit rather than an ability indicator. In particular, feeling a personal connection to Einstein fostered persistence in the face of challenges. While the control group only made general self-reflective comments about their academic progress, those who read “struggle stories” identified specific areas for improvement. As Xiaodong Lin suggested, introducing an element of humanity into the sciences helped students understand the function of mistakes. Echoing earlier examples of “disasters” as learning experience, her study showed the importance of a productive education in failure, giving students the ability to learn from errors while confronting, conceptualizing, and preparing for them.

Stressing the importance of teaching people to be information seekers rather than passive receivers, [Luz Santana](#) (Right Question Institute) described the role of inquiry and the institutional politics of failure. The ability to formulate questions as a self-advocate is a vital skill for navigating organizational systems instead of simply receiving services. In a welfare office - where people are reminded of their dependency - this provides a chance for self-realization. She noted learning *how* and *what* to ask is better than being given the queries outright. Echoing Xiaodong Lin, she argued teaching students how to think using questions and “manage ignorance” is a skill overlooked in schools. Failure to inquire has wider implications for democratic effectiveness. While increased voter turnout could foster greater participation in low-income communities, acts of lobbying, demonstrating, community organizing, and learning to ask questions of authority are more effective in helping neighborhoods take control of their futures.

Responses

Drawing on previous panels which highlighted the benefits of focusing on “process” rather than “product,” [Sara Jane Bailes](#) (Theatre and Performance Studies, University of Sussex) argued academia does not accommodate failure for learning’s sake. The limited luxury to take risks within education means knowledge exploration is increasingly replaced by result-driven learning. Using models of persistence, rather than victory, are better for teaching students the importance of struggle and the process, removes emphasis on the end result.

[Alondra Nelson](#) (Sociology, Columbia University) described decline as a social process, urging panelists to ask “whose failure is this?” when considering individuals at the welfare office. Examining the underlying socioeconomic conditions of institutions associated with “failure” would help reveal its place within privilege hierarchies. She questioned the benefit of Einstein’s struggle stories, as his fame might be inspiring but also paralyzing, as opposed to highlighting the banality of everyday scientists. Heroic narratives of breakthroughs leaves no room for complex stories of success and errors. Luz Santana suggested teachers have limited ability to create safe spaces where students can freely inquire. Moving beyond the “no such thing as a wrong question” notion, educators shouldn’t be expected to have every answers. Instead, admitting their own limitations might foster an atmosphere of greater transparency.

DECEMBER 8, 2017 - DAY 2

Session 5: Narratives of Failure

Historian of science, philosopher, and poet [Jennifer Hecht](#) explored doubt through her studies on the history of atheism and enlightenment science. Echoing earlier discussions of “essential tension,” she emphasized how research is interlinked with narratives of uncertainty. Highlighting skeptical movement philosophies that harness doubts to explore and accept new ideas, she argued knowledge limits and being proven wrong are the basis of human existence theories. She focused on the French Society of Mutual Autopsy’s experimental approaches. Formed in the 1800s to advance neuroscience by dissecting deceased members’ brains, their (failed) attempts to discover if the soul was part of the brain nonetheless helped to reconcile Catholic and scientific notions of the body. She argues poetic conventions lie outside the criteria of popularity, and are thus a more productive way of considering the endeavor of exploration.

[Scott Sandage](#) (History, Carnegie Mellon University) explored the definition of success and error in current political discourse. Drawing on his book *Born Losers: A History of Failure of America*, he examined the place and tropes of mistakes. The language of failure and losing is relatively new in the American idiom. 20th century businesses adapted the language of the average American, with expressions like “investing in myself,” becoming increasingly popular. By the mid-20th century, the concept of failure took on a new meaning. If failure previously describe striving persons who had fallen short, it was now aligned with a *lack* of ambition. Scott Sandage explored this evolution of failure from life event to identity, through the lens of the 2016 U.S election. Comparing Donald Trump with Willy Loman - the protagonist in Arthur Miller’s play *Death of a Salesman* - Scott Sandage suggested the possibilities for a synthesized definition and understanding of error across disciplines. Fear of mistakes and the drive for success are so closely intertwined they are hard to distinguish. The business of failure (and failures of business), mediate the porous boundaries between self-judgement and judgement from others, highlights the radically different language used to describe Trump’s six failed companies in comparison to his tweet that “Crooked Hillary Clinton is the worst (and biggest) loser of all time.” While success and failure might seem to be more neutral terms related to desired aims and collective achievement, the idea of winning and losing indicates an increased focus on opposition and competition.

Responses

The panelists explored the conventions of tragedy as narratives of mistakes, redemption, and enlightenment. Highlighting the misdirection and distraction used by the current administration as to obscure failures, the panelists described the act of considering one’s errors as a moral process, which comes with the ethical results of self-reflection. These presentations questioned the uses of history as it can lead and guide through its collection of cautionary tales that are worth sharing, even if doesn’t directly solve problems. By stressing the positive value of looking for one thing and finding another, failure encompasses both uncertainty and spiritual questions of belief and doubt. Jennifer Hecht echoed previous panels by noting scientists have collected huge quantities of data using theories and methods invalidated in hindsight. How do we reckon with pseudo- and debunked- sciences once they’ve lost credibility? Is being remembered positively more important than “winning”?

The tragic notion embodied in Willy Loman’s character leads us to consider whether all failures are necessarily narratives of catastrophe, whilst reconsidering the inherent assumptions in evaluating mistakes. Society has socialized success, but not failure. When individuals falter, it’s indicative of their character or inadequacies, however achievements provide the possibility to share in collective gain. How do we reconcile the contradictions of success and failure within the capitalist system? To what extent is a flourishing culture built at the expense of others’ errors.

Session 6: The Psychology of Failure

Robert Siegler (Cognitive Psychology, Carnegie Mellon University) sees failures as acquired knowledge to be used progressively in relation to broader aims. Referring to Alexander Fleming's ruined bacterial colony that led to the discovery of penicillin, Robert Siegler reiterated that falling short of one goal often suggests a new and more important one. Certain objectives and curricular obligations (i.e. math) are assumed to be so important that society finds them non-negotiable (as opposed to optional activities like soccer). Should "success" be obligatory even if the individual has no interest or ability? Should we be afforded the flexibility to prevail only in what we want to? Or should we learn certain fundamental lessons regardless and struggle by? This idea of "success" despite personal desires echoes Day 1's discussions of consenting to the universal law for the common good. Is the experience of trying and failing part of a common necessity for individuals? Yet the value of social feedback can determine relationships to one's own work. Robert Siegler cited psychologist John Garcia's study of coyotes' taste aversion, which was vindicated only after challenges from the scientific community. Through his persistence in repeating and replicating results, he was able to amass concrete evidence and silence his critics. Robert Siegler offered a mantra to summarize this dynamic: "know when you're right, even if everyone says you're wrong, and prove it to them." And yet, reluctance to admit defeat often limits the pursuit of alternative routes. How can the possibility of failure be balanced with an openness to exploring unexpected discoveries, even if it deviates from initial plans? Seeing "missteps" as a positive process offers a broader typology for changing behavior beyond simply abandoning original aims. Delaying or reducing the inquiry's intensity, working towards the same target via a different methodology, or focusing on another goal are means of making failure reactive as opposed to the absence of success. Being open to unexpected findings reaffirm failure's place as a worthwhile step to an indefinite adjective.

John Black (Telecommunications and Education, Teachers College, Columbia University) explored success and failure by having graduate students play *Electropocalypse*, an online game where users engineer and fix electrical circuits. Information seeking followed by targeted fixes was the most effective "winning" strategy, but students didn't find this method efficient as it *required the most work*. Thus the attainment of success is linked with effort, while asking how students could be encouraged to work harder? Perhaps it is only by attempting (and often failing) to go beyond ability limits that capacities are extended. He highlighted Xiaodong Lin's descriptions of "struggle stories" and Dr. Carol Dweck's idea of neuroplasticity (brain growth) to suggest that encouraging increased effort is the best way to ensure success. Micro- or mid-task failures must be addressed and considered as a crucial step in any aim.

Catherine Chase (Cognitive Studies, Teachers College, Columbia University) approached failure from the design thinking perspective increasingly adopted in education. Rapid prototyping, which operates on the mantra, "make, test, think," fosters a mindset that embraces mistakes and values early feedback. "Failing early, often and forward" shows the benefits of trial and error, but questions the weight we give it. Should we always respond positively to evaluation, even as it contradicts our aims, beliefs, and ideas? For Catherine Chase's study, she used teams of 5th graders for a design challenge. The content development group was limited to one prototype, which could not be altered after product trials, while the rapid prototyping group was allowed to adapt after each test. Though the first group worked longer on their prototype, the second group's design performed better. Yet Catherine Chase suggests teachers have less capacity for accepting error than their students, even as studies show the effectiveness of emphasizing failure through design teaching models. Design thinking methods also offers *educators* interactive feedback to employ. How can repeated failures be used for *content* learning? The iterative process allows for a reflective and high-quality educational approach. While rapid prototyping benefits by using mistakes as stepping-stones to success, the speed provides less opportunity for careful reflection. Is producing multiple drafts better than creating only one? The "permission to fail" mindset reduces the stigma of errors by recasting them as an integral part of educational development.

[Lisa Son's](#) (Psychology, Barnard College, Columbia University) focused on the role of failure in metacognition, a crucial component in understanding the individual doesn't have every answer. Learning a new skill requires working intensely for limited initial results. This learning curve moves increasingly slowly before it plateaus at sufficient knowledge. Yet for most adults, the prospect of learning something new comes with a false expectation of a steady improvement. However, children experience small failures repeatedly as a fundamental part of learning basic skills. This uncertainty and inadequate progress drives many to give up, either because the task was not conquered within an allotted time or was perceived as "too difficult". Understanding the learning curve structure, where effort is cut short unless it quickly manifests in positive results, recognizes failure as part of the ordinary achievement process. Metacognition asks "how do you know what you know?" as a means of judging and reflecting on our own learning. Yet exerting effort without immediate success creates the illusion of failure. How can labor be rebranded without foregoing preparations for the inevitable mistakes, while not letting the possibility of failure deter trying? Mistakes should be avoided, but can only be averted by experience. However, "thinking outside the box" is rife with unavoidable blunders. As fast learning leads to quicker decay, Professor Son argued difficulty should encourage slow, and deliberate "mistakeful" learning.

Session 7: Failure in the Sciences

[Mario Livio](#) (Astrophysics, University of Nevada, Las Vegas) spoke about the psychological effects of perceptual and epistemic curiosity, the subject of his latest book, *Why?* He argued perceptual curiosity wards off boredom, while epistemic curiosity explores a specific thematic detail. Comparing Leonardo da Vinci's and American physicist Richard Feynman's notebooks, Livo found both men wrote about variety of fields from physics to bongo drumming. Perceptual curiosity, with its ambiguous and fleeting stimuli, activates the brain areas connected to stress and conflict, while epistemic curiosity engages cognitive systems that create reward anticipation.

[Peter Norvig](#) (Google) discussed failure in "software life cycle" as coders, and developers design and test programs. Like the design thinking methodologies outlined by Catherine Chase, software creation is driven by error and oriented to detect mistakes as early as possible. Peter Norvig suggested categorizing failure not as a stumbling block, but a directional change. The story of Flickr – Stewart Butterfield's photo sharing platform created only after a previous project collapsed– demonstrates the possibilities of identifying and shepherding successful parts of larger errors into success. A/B testing (comparing two web page versions to judge performance) depends on control and variation to enhance user experiences. Choosing the most successful product iteration is a natural pursuit, but there are problems with this approach too. While it may be appealing to test 41 shades of blue for analytics, is it worth it? What is the value of feedback we receive? And how does the market determine evaluation mechanisms, rather than what we need?

[Michael Shadlen](#) (Neuroscience, Columbia University Medical Center) saw failure in science as a similar processes to the relationship between tension and release in art. Formulating impromptu ideas and embracing uncertainty (like the improvisational tendencies of jazz), involve moving beyond comfort zones. In medicine, embracing failure is only an acceptance of the brain or body's breakdown. This is a fixable mistake, corrected by skills and procedures designed to contain errors and help the patient. As Michael Shadlen described, self-reflection in the laboratory allows scientists to address missteps and learn from their decisions. In this sense, errors *are the art of science*. Knowledge is not just the representation of information, but its integration. Studying how the brain makes decisions helps show how we experiences the world around us. The parietal lobe, which connects the senses, contains neurons

that retain information while the individual makes plans or anticipatory decisions. To avoid conflict, it's easier to return to what is expected than to move outside this frame.

Responses

What is the best way to engage with the narratives of genius and top-down theory? Are they useful philosophies compared to the reality of trial and error, mistakes and modifications? The connections between the incompleteness of our knowledge and the empirical whole requires a sense of humility and accepting imperfection. The panelists discussed pivoting the emotional-cognitive scaffolding towards an iterative model. However, what is lost if we move *too far* from the top down design? As technological advances allow for increased automatic prediction, is there an inherent danger if we don't have to understand how our tools (computers, machines, the brain) work? Echoing Lisa Son's discussion of metacognition, the uncertainty of how our own bodies process information is part of the failure humans must constantly contend with.

Session 8: Failure in Economics

[Katharina Pistor](#) (Law, Columbia University) examined economic failure through Adam Smith's concept of the "invisible hand" - that the individual's pursuit of his self-interest also benefits the larger community. She referenced his *The Wealth of Nations*, which assumes the entrepreneur will return "home" to invest his money due to his knowledge of local laws and a desire to assist his "neighbors." Yet, Katharina Pistor argued, the creation of global institutions with a legal support structure made it easier to conduct business anywhere, allowing the entrepreneur to be oblivious to local laws and less connected to residents. Although international organizations like the International Monetary Fund have broad oversight, domestic regulations also govern the movement of capital and people. Determining precedence between multiple systems is a key ambiguity within international law as some nations resist subjection to external legal regimes. As individuals maximized self-interest 'offshore,' strategies designed to maintain Adam Smith's conditions have failed and severed the link between the community and the entrepreneur's wealth. As the state supports individual accrual, the invisible hand is no longer reliable. This "dialectic of failure" becomes cyclical: the benefits of international legal control over the flow of capital requires individual countries forfeit authority. Could nations reverse the personal liberalization within markets and restore the connection between society and personal gains? Katharina Pistor argued that as international capital moves through a smaller number of individuals, the challenge of scaling legal protections to a global level signals the limitations of domestic authority.

[Josh Wolfe](#) (Lux Capital) believes the philosophies of failure in finance comes from an inability to *imagine* errors. Thinking big and asking "what sucks?" allows venture capitalists to identify and target potential investments. He outlined the three "business edges" used to make informed financial decisions: the informational, the analytical, and the behavioral edge. An informational edge is the ability to access superior insights not available to others; the analytical edge is an investor's effective interpretation of available data. A behavioral edge is understanding and exploiting human mistakes, while anticipating other's tendencies. Despite these advantages, strong social pressure to "stay with the herd" through predictable investments inhibits exploration of new industries and deviation from the status quo. The best way to predict the future is to invent it. Josh Wolfe showed how science fiction is crucial to imagining upcoming trends that have already been conceptualized. While automation eliminated some professions, technological advances created countless new jobs unthinkable a decade ago. By the same logic of thinking on a different timescale, investors can use the imagined future to make real world investment decisions. With the high funding availability, capitalists can expect failure, but also huge results.

Responses

Unpacking the relationship between individual and collective gain, [John Spiro](#) (Simons Foundation Autism Research Initiative) wondered if schools support the entrepreneurial spirit, while Josh Wolfe believed the collective concept of “we” was needed to accept mistakes in the financial world. Organized around a common enemy, the tribal psychology replaced individual self-aggrandizement. However, there is unevenness in venture capital participation; investing in a hedge funds is prohibitively precarious and expensive for an average person, while invited investors use only a fraction of their wealth. How can collective failure be an empowering structure of mutual responsibility and risk? As Katharina Pistor noted, the world’s legal and financial frameworks allow for limited company liability. As artificial persons, corporations have free movement compared to natural persons bound by borders. Separating the necessary from the desirable is central to establishing effective regulations for unintended effects. Automation showed the social cost of innovations; can it be viewed as a success? Katharina Pistor was skeptical and argued for equal technology access enforced by government policies, but accepted the legal scope is limited and could only prevent egregious issues. John Spiro wondered what legislation would promote the public good and diversity in venture capitalism, while Josh Wolfe was adamant that flexible immigration policies allowing the free flow of people, capital, and ideas would benefit society.

Session 9: Failure in the Arts - A Conversation about Performance

[Chris Washburne](#) (Music, Columbia University) argued productive failure is central in jazz. Using the example of Herbie Hancock’s piano mistake which forced Miles Davis and his trumpet to adapt, the synergistic relationship between players is key in improvised compositions and unexpected harmonies. Jazz musicians have a professional mandate to create. Why are mistakes in jazz performances rarely perceived as failures, but as exciting parts of a performance? “Mishearing” relies on spontaneous feedback to correct and adapt to individual errors. Whereas previous panels noted that instantaneous response is limited in academia (i.e. a seven-year tenure review), jazz has immediate responses. The strength and quality of reactions from an audience or the players themselves signals the success of the individual’s efforts. “Playing a gig” defines play as labor, a key part of design thinking where building, failing, destroying, and repetition defines success and creation. Jazz contradicts over-articulated notions of progress by seeing failure as an iterative, indefinite process. Chris Washburne states, “It’s not the note that’s wrong. It’s the following note that determines success. It’s what you do with failure that matters.”

[Sara Jane Bailes](#) (Theatre and Performance Studies, University of Sussex) discussed failure as a flexible condition that inspires continuation in the face of adversity. Working in the shadow of artists like Virginia Woolf, Gertrude Stein, and James Joyce who embraced the impossibility of representing human experiences, Samuel Beckett’s theater challenged and subverted the idea of imitation as a failure of tools and resources. In his play *Waiting for Godot*, the possibility of gathering people to watch nothing happen relies on the characters in the room. Samuel Beckett challenged what theater does, transforming the craft into an ethnographic study of process where progress is slow, imperceptible, and boring. Sara Jane Bailes advocated for theater which did not try to copy the world, but instead *make more of it*. Rather than reasserting the illusion of power and control, embracing the medium’s provisionality and inadequacies allows for true “realistic” art.

[John Collins](#) (Elevator Repair Service) explored the role of error in music, where failure is both a process and a product, by arguing its mistakes cannot be intentionally reproduced. The experimental theater methodology embraces the unplanned by transforming gestures and texts through performative representation. Yet no matter how rigorous the attempt, the result will always be different. While rehearsal is seen as time for reducing the likelihood of error, experimentation and improvisation is easily

(and wrongly) collapsed with “messiness” or an idea that “anything goes.” Echoing Tim Wu’s discussion of legal regimes, this panel argued the experimental process could test limits as part of creating a productive diagnosis. What happens when you run at the walls and break rules? Sara Jane Bailes favored leaning into representation failures allowing for a new kind of expression. Reproducibility and rehearsal in the arts echoed the previous panels on science. While unintended consequences in the laboratory are typically viewed as negative, accidental discoveries drive many scientific breakthroughs, suggesting positive ways unpredictability can be creatively harnessed.

Differences in funding and resource availability helps create grounds for experimentation and the freedom to fail. Venture capitalists are afforded these advantages due to the industry’s wealth. Meanwhile, theaters often operate on shoestring budgets, forcing innovation and a collective sense of humor. Elevator Repair Service’s early rehearsal spaces were members’ apartments without any props. Yet these constraints enabled and encouraged artistic improvisation, as they embraced other means of representation that they might have otherwise ignored. The poetics of possible failure - and accepting things might fall apart - is generative. It also requires courage.