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Unveiling Impact Identities: A Path for Connecting Science and Society

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Synopsis We propose a thoughtful process for scientists to develop their "impact identity", a concept that integrates scholarship in a scientific discipline with societal needs, personal preferences, capacities and skills, and one's institutional context. Approaching broader impacts from a place of integrated identity can support cascading impacts that develop over the course of a career. We argue identity is a productive driver that can improve outcomes for scientists and for society. Widespread adoption of the concept of impact identity may also have implications for the recruitment and retention of a more diverse range of scientist.

Introduction

Over the course of their career, most scientists cultivate an identity aligned to the research they conduct, their contribution to their professional community, and the relationships and partnerships they form within their scientific community. Scientists develop this self-concept and identity by distinguishing themselves from others (mostly non-scientists) through a process of "social differentiation" (Tajfel 1982; Tajfel and Turner 1986). The identity as a scientist is often limited to expressing oneself to professional peers and does not ordinarily connect scientists to public audiences. Here we explore how a narrow perspective on scientists' professional identities has implications for the way the scientific community relates to society. We describe benefits when individual researchers find alignment between their research efforts and public engagement with science. We posit that an expanded professional identity, which we refer to as impact identity, can enable researchers to find a productive way to leverage their research for a broader common good and make strategic and efficient use of a growing system of support mechanisms at the intersection of science and society.

Here we use the terms "scientists" to encompass those who investigate natural and physical phenomena. However, we maintain that these concepts are relevant to engineers, computer scientists, social scientists, and interdisciplinary and applied scientists. We use "success" in two ways with implicit meanings. With regard to broader impacts, success is still quite subjective and the topic of ongoing study and evaluation; for our purposes success refers to situations in which scientists and audiences engaged in science perceive a benefit from broader impacts activity. The concept of a successful scientist differs between disciplines and institutions, and evolves over time. In general, we consider a successful scientist is one who is considered successful by their peers.

Impact identity results from a thoughtful and intentional integration of a scientist's multidimensional self-concept. It blends the researcher, someone who aims at contributing knowledge within a scientific discipline, with the engaged scholar, or someone who ensures results of this research benefit society. Impact identity incorporates a scientist's discipline and scholarship; personal preferences, capacities, and skills; institutional context, and the various

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communities or social settings in which s/he participates. By integrating these various aspects of a scientist's skills, interests, and opportunities, we expect that a well-developed impact identity can foster approaches to broader impacts that result in better outcomes for the scientist and for society. For scientists, this manifests as more rewarding experiences conducting public engagement in a way that represents them as a whole person. The experiences of public audiences who take part in these public engagement activities should also be improved.

Unveiling and applying impact identity is certainly not enough to achieve high-quality broader impacts. Scientists must also assemble, and make use of, a supportive structure of partnerships and relationships that enable broader impacts success. Fortunately, a growing number of professionals at universities and organizations that engage the public can serve as brokers who help scientists develop relationships and skills and garner the resources necessary to explore the best ways to achieve broader impacts. Well-developed impact identities can serve as a glue between scientists and those who support them, allowing scientists to choose between the myriad of options that exist for connecting public audiences to their research (Storksdieck et al. 2016).

In the sections below, we ground the concept of impact identity in relevant theory about the social boundaries between science, as a subsystem of society, and other sectors of society. We consider the way the scientific enterprise is situated in society; both demarcated from, and in fluid dynamic exchange with, other sectors of society. We then describe societal impacts of research in terms of broader impacts, focusing on the current funding and professional landscape of science, particularly as it applies to the National Science Foundation (NSF). We include two examples of scientists with well-established impact identities. We end with principles for understanding critical dimensions of scientists' identities and an approach to developing impact identity that can help move forward or advance their broader impacts work.

Science and society: theory to inform impact identity

While we live in a "golden age of science" with extraordinary rapid scientific discovery, we are also experiencing anti-science activism that is couched in a narrative of scientists and science as the "other", apart from society and its interests (Hockfield 2018; Holt 2018). Anti-science attitudes play off established social phenomena demarcating the scientific community from non-science realms of society in a way that bestows scientists with authority on scientific process and knowledge about natural and physical phenomena (Gieryn 1983). Assigning authority to a professional class is not limited to science, but is something that is just as true for lawyers, physicians, electricians, and most other professions. The "boundary" between science and other sectors of society is maintained, in part, by strong scientific identities and social interactions that maintain distinctions between groups (Tajfel and Turner 1986). Such boundaries and identities between the realms of science and non-science have been a topic of interest and study for decades (Gieryn 1983, 1995, 1999; Abbott 1995, 1988; Ibarra 1999; Lamont and Molnár 2002; Weingart and Lentsch 2008; Franzen et al. 2012; Clarke et al. 2013).

The demarcation between science and non-science protects the integrity of systematic scientific investigations that build knowledge about the world (Weingart and Lentsch 2008). On the other hand, strong identities and social boundaries come with distinct practices and worldviews that can isolate the scientific community from other sectors of society (Abbott 1988; Gieryn 1995; Seo and Creed 2002). One prominent example where science integrity and norms clash with other sectors of society is the conflict about whether to teach creationism, intelligent design, or evolution in schools. This conflict over which group can claim authority on how we should educate children in the core principles of the life sciences pits science against religion (Brooke 1991).

Maintenance of social boundaries between an expert community and society comes as a cost. For instance, the typical forms of communication, including the use of expert language in peer-reviewed journal articles that themselves are mostly inaccessible to non-scientists limits non-scientists' access to the resources and knowledge of science (Lamont and Molnár 2002). Again, this phenomenon is not limited to science, but it reduces opportunities for the public to engage in meaningful science experiences and for scientists to engage with the public. Fortunately, boundaries between the realms of science and non-science are unstable, always shifting, and being redrawn (Gieryn 1983, 1995), as citizen science powerfully demonstrates (Bonney et al. 2014). Professional identities also shift when individuals experiment with different professional selves (Ibarra 1999; Clarke et al. 2013). Scientists are increasingly required to engage in activities that show the societal impact of their research. Scientists can more easily engage with the public, and vice versa, when they see themselves as part of a larger societal

whole, rather than apart from it. Blurring boundaries, and thus integrating science as part of society, therefore opens scientists to potentially rich and innovative exchange with non-scientists (Engeström 2009; Wenger-Trayner and Wenger-Trayner 2015).

Broader impacts and the science funding landscape

Over the last several decades there has been a steady decline in the portion of the federal budget allocated to research (Office of Management and Budget [OMB] 2017), increasing the sense of fierce competition for funding among scientists (Mervis 2017). Meanwhile, the NSF has expanded proposal requirements beyond intellectual merit, explicitly requiring broader impact plans to address societal benefits of the federal research enterprise (National Science Foundation [NSF] 2014). The term broader impacts encompasses a wide variety of potential activities, partnerships, and processes that may enhance the societal benefits of funded research. The NSF explicitly avoids prescribing activities that qualify as broader impacts. Nonetheless, it provides examples such as enhancing public safety, national security, economic prosperity, science learning, broadening participation in the scientific enterprise, and public engagement with science. Although broader impacts include a wide array of activities, outreach and public engagement tend to dominate in fields such as biology, ecology, astronomy, or physics where commercialization is of less importance. Incidentally, the NSF is not the only science agency to pose such challenges to the scientific community. Medical research funded by the National Institutes of Health fits along an implied impact pathway from bench to bedside, with an ultimate goal of improving human health. Department of Education funding similarly aims at improving teaching and learning. Agencies such as NASA and NOAA tie funding to mission success. The NSF broader impacts criterion achieved a new significance over the last few years, though. Expectations for the quality of broader impact component of NSF proposals have increased considerably, elevating broader impacts as a funding criterion from a marginal consideration to one highly relevant to funding success (National Alliance for Broader Impacts [NABI] 2018).

Many scientists piece together a patchwork of broader impacts activities across several programs and grants, addressing them more as a required box to check than an integral aspect of their professional work (Malcom 2018). However, a widely untapped opportunity exists for researchers to instead expand their professional identities and build a legacy of impacts over the arc of their science career, similar to what successful researchers already do with their research portfolio and research direction. Building one's impact identity and developing a portfolio of complementary projects can feel out of reach and under-supported. Lack of professional preparation, mismatched institutional reward structures, and norms of practice within disciplines are common barriers to systematically addressing broader impacts as an integral part of research itself. Many scientists overcome these constraints through bootstrapping, managing to develop the necessary partnerships that help them create successful broader impacts activities (Risien and Nilson 2018). Below are two examples of seasoned scientists who integrated the many dimensions of their identities in order to develop outreach and engagement activities that fit their interests, capacities, societal needs, and research. They both started with modest projects built out of initial partnerships. As they have developed in their careers, those modest beginnings gave rise to a series of increasingly impactful projects, each growing out of the success of the previous. Both scientists have made commendable contributions by blurring the boundaries between science and other sectors of society. They leave in their wake a legacy of broader impacts.

Building the trail of time with underrepresented students

The Trail of Time Exhibition is a fully accessible three-mile-long interpretive timeline trail along the Grand Canyon's south rim that interprets the nearly 2 billion years of Earth's history preserved in Canyon rocks. The trail represents the final product of a systematic effort around broader impacts by University of New Mexico geologist Dr. Karl Karlstrom. He began researching in the Grand Canyon in 1983. A decade later, Karlstrom, his colleague Dr. Laura Crossey, and others wanted to use their emerging research findings to enhance public science literacy around Grand Canyon geology. They recognized that the canyon offered a unique opportunity for visitors to immerse themselves in geology. They started with simple questions about what park visitors may, or may not, be learning about geology. To establish the mechanisms to answer this question they cultivated partnerships from "the top" with park superintendents and from "the base" with park rangers. They worked to collaboratively build their long-term impact plan through a consensus process with partners, along the way bringing underrepresented

students into this work. The plan focused on where the goals of scientists, park rangers, and administrators overlapped. Following an NSF planning award, the partnership eventually secured significant funding to develop and build the exhibition. By then the team included academics, students, park interpreters, museum evaluators, and exhibit design specialists. The exhibition opened in 2010 and soon after received an award from the National Association for Interpretation. The team now continues to use trail of time for research on learning and teaching in formal and informal contexts. A logical extension of the geologists' identity as scholars to researchers on how people learn geology. They also work to export the concepts behind trail of time to other parks and educational venues throughout the Colorado Plateau.

The enduring installation is not the only success of their commitment to achieve broader societal impacts with their research. Along the way, Karlstrom and Crossey took on the role and responsibility to mentor several underrepresented students through their transition from undergraduate to graduate studies. They helped students develop personal and professional networks that enable students to more fully participate and progress in their education. This story highlights the years of persistence and ample energy to cultivate partnerships. With initially limited resources, the team was able to create an effective and enduring geoscience experience. Along the way, they provided many of students with motivation to connect their own scientific inquiry to effective public outreach. The story also highlights the extension of the geologists' identity as scholars in geology to becoming scholars of geology learning for all.

Cascading impacts of reconnecting people with trees

Dr Nalini Nadkarni's personal mission is to engage those with no access to forests in learning about forest ecology. Early in her career Nadkarni was struck by how most science outreach "preaches to the choir" and only involves those already interested and engaged in science learning activities. Nadkarni's strong sense that learning about forests and plants should be available to all made her decide to reach new audiences in unexpected places. One group, not commonly considered as an audience for science, is the more than 2 million inmates in the nation's prisons and jails. Early on Nadkarni visited inmates and shared her enthusiasm for science and her love of forests. These visits opened a world of possibility; she enlisted the prison system as partner, and engaged inmates as co-producers to cultivate mosses to repopulate Pacific Northwest forests affected by destructive moss collection for the floral industry. This work led to a sustainability lecture series at the prison, which led to sustainability programing in the prison, and prisoners raising endangered tree frogs to support wild populations. Hers is a story of cascading impacts that are possible when a scientist integrates several dimensions of their identity in their professional life. Nadkarni has spent a career studying trees and contributing to understanding the value of the canopy ecosystem. She also cultivated necessary tools and partnerships to engage those with little access to nature as part of her sense of social justice and her deep belief in the beauty and fascination that forests hold even for those who cannot visit. Her journey centers on her goal of finding common ground with audiences who have little access to science, and who may not value science unless they experience authentic encounters in which scientists care.

Karlstrom and Nadkarni's stories serve as examples of successful scientists with strongly developed impact identities. They have done their broader impacts without sacrificing intellectual integrity or disciplinary standing. They have instead leveraged scientific success as an asset to enhance their impact. Karlstrom and Nadkarni derive substantial personal and professional satisfaction from their impacts work. A stark contrast to many scientists for whom fulfilling broader impacts is intimidating or may feel like a chore. For Karlstrom and Nadkarni broader impacts work emerged from an integrated identity; it served them both professionally and personally. They were both able to build partnerships to pave their way to success. They also played the long game, starting modestly and building from small-scale early successes. In this way, they managed to avoid the piecemeal effect of disjointed broader impacts projects that do not strategically connect with a scientist's research, or with their emerging professional impact identity. Scientists like the two highlighted here serve as the inspiration for developing the concept of an impact identity. In the following section we elaborate on the concept, its elements, and processes scientists can use to develop their impact identities.

Unveiling impact identity: from exploration to action plan

In 2012, various universities were embarking on processes to identify the specific tools and supports scientists and engineers need to effectively design, implement, and evaluate quality broader impacts.

Eventually forming the National Alliance for Broader Impacts (NABI), with funding from NSF, this community now has nearly 700 members who collectively are refining practices that aid scientists in their broader impacts work (J. Risien, submitted for publication). Despite increasing resources, such as training and broader impacts offices, many scientists still tend to rely on limited networks and processes to develop their broader impacts while feeling underprepared to expand or improve their broader impacts work (Risien and Falk 2013; NABI 2018). Nonetheless, demand for broader impacts support is on the rise and professionals who support broader impacts receive frequent requests for "just in time consulting" to help scientists develop broader impacts plans for proposals. This practice can bolster quality of broader impacts plans by connecting researchers to partners and often well-established and adequately evaluated programs to fulfill proposal requirement. However, this approach also positions the principal investigator as a passive actor who outsources broader impact work in order to concentrate on the research aspect of their grant. All too often, this represents a missed opportunity to cultivate skills and align the nature of their research, personal interests, strengths, and institutional capacities with broader impacts. While *ad hoc* solutions to broader impacts fulfillment can have positive outcomes, we argue that a more systematic approach lies in deeper engagement of the researchers themselves. Unveiling and nurturing scientists' impact identity is a critical component of a broader impacts strategy.

"Unveiling your impact identity: fueling your passions and mapping your assets" was a workshop. It was developed to help scientists: 1) explore the many dimensions that together make up their "impact identity"; 2) establish career-long impact goals; 3) identify personal and professional assets that support those goals; and 4) develop a plan to cultivate a toolset to achieve those goals over the long-term. In order to explore these four goals, participating scientists listed scientific issues and research questions about which they feel passionate. Then they recall the point in time when their decision to pursue a career in science was clear, but still unadulterated by concerns of publication rates and career advancement. Next, participants consider the multidimensionality of their own identities, including, but not limited to their identity as researchers, communicators, citizens, as educators, inventors, family members, hobbyists, etc. Identifying one's various self-concepts expands the scientists' frame of reference about skills, interests, and capacities beyond their focused area of research. The various dimensions of identity are examined in order to find connections between research interests and other parts of the scientist's personal experiences. This approach is based on studies which show that scientists are best able to conduct public outreach when they align their (scientific) agendas with expectations of prospective audiences; are part of a systematic effort to reach audiences, receive training, and support; and can build off of initial investments in outreach activities (Selvakumar and Storksdieck 2013; Storksdieck et al. 2017).

The deep-dive into impact identity includes five critical elements, each described below, that participating scientists explore with their participating peers.

(1) Personal identities and intrinsic motivators make up the personal preference dimension. Are you a parent, musician, minority woman in science? Do you enjoy working with children, youth, or adults? Do you see yourself as communicator, teacher, or inventor? Are you an activist, environmentalist, engaged in civic action?

(2) Individuals have certain capacities and skill sets that are somewhat innate or have been cultivated over time, and can guide the type of public engagement that might most suitably fit with a scientist's personally traits and interests. Are you a patient listener? Are you equipped to work with underserved audiences? Do you engage well with children? Are you an introvert or an extrovert? Can you explain your research to lay audiences?

(3) One's approach to research and scholarship adds a dimension that is deeply connected to the everyday professional practice of scientists. Through broader impacts, scholarship often expands beyond the boundaries of a discipline or the core of a research portfolio. What is the nature of your research? What instrumentation do you use? How applied, practical, or theoretical is your research? What are the links between your research topic and potential applications? How might your broader impacts work open new dimensions of scholarship? To what degree might connections outside your circle of disciplinary colleagues support your career trajectory?

(4) Institutions also have identities and scientists do their work within the context of the institutions they inhabit. To what degree does your institution appreciate, support, and reward investments into broader impacts work? Does your

institution have a public service or outreach mission? How is your institution connected to various local or regional communities? What kind of infrastructure exists through your institution to support what type of broader impact efforts (e.g., office of commercialization; institutional connection to local schools or science museums; public speaker or science café/pub series; opportunities to influence policies, legislation, or regulations; etc.)?

(5) Disciplines of science are a major contributor to scientists' professional identities. Affinity with and connection among a disciplinary group is often a prominent dimension of identity. What critical questions drive your discipline? To what degree are fundamentals of your discipline already part of a K-16 curriculum? What are norms within your disciplinary society around broader impact work? How do your successful colleagues conduct their broader impacts?

We posit that ideal impact identity sits at intersection of these dimensions (Fig. 1). As part of creating a personal impact plan for their research, participants in the workshop explore, discuss, and record the various areas of overlap between these five key dimensions of identity to hone in on their individual impact identity. An important sixth dimension accounts for known or perceived societal needs. Researchers are encouraged to think broadly about the societal benefits of their particular research, acknowledging that not all research portfolios easily translate into direct benefits beyond contributions to the scientific knowledge base.

Broadly speaking, researchers explore three basic questions through the workshop. Examining the overlap between discipline and societal needs leads to the question: why or what about my research may be of interest to anyone outside a group of my scientific peers? In the long run, an engaged scientist may ask: what should or could I focus my research on such that it does benefit society? Exploring the intersection of personal preferences and capacities, researchers can ask the question: what would I love to do that I am also well-equipped to do?

These, or related questions, allow researchers to explore options for impact work that align many dimensions of their identity and acknowledge the contexts within which the scientist operates. This systematic approach builds on the nature of the particular research and discipline. It takes into account the interests and perspectives of target audiences, whether those are peers, policy makers, regulators, product developers, a science-attentive public, citizen

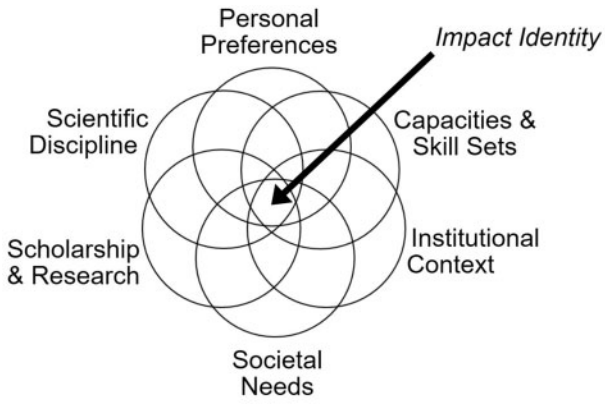

Fig. 1 Multiple dimensions of identity and contexts to explore and integrate in the process of unveiling one's impact identity.

scientists, schoolchildren, teachers, or interpreters and educators at science museums or other informal science learning settings (Storksdieck et al. 2016). Scientists ultimately can use a series of inquiries and reflections about the intersections of the dimensions of identity to build an action plan. Scientists use an action plan to articulate how they will cultivate the skills, programs, people, and relationships needed to reach impact-related goals and define concrete steps that foster the development and growth of a career-long trajectory that integrates the needs of science with the needs of society. Designed to help scientists focus their broader impacts work, this approach integrates the intellectual merit and broader impacts of their life's work. It offers an opportunity to establish career-long goals concerning scientific and societal impacts, identify personal and professional assets that support those goals, and learn to cultivate a toolset to achieve those goals over the long-term.

Discussion

Universities, science centers, professional associations, and community organizations are actively developing systems to support scientists in their efforts to strengthen the societal benefits of their research (Risien 2017; NABI 2018; Risien and Nilson 2018; J. Risien and B. E. Goldstein, submitted for publication). *Ad hoc* activities to fulfill broader impacts requirements are being replaced by systematic approaches supported by an emerging university infrastructure and a class of support professionals who specialize in helping scientists fulfill broader impacts requirements. They engage researchers in professional learning that goes beyond outsourcing broader impacts and instead aims at changing capacity and attitudes to help researchers gain a new identity for

providing broader societal benefits that emerge from their scientific endeavors (J. Risien, submitted for publication).

Science is an evolving profession and perceptions in the scientific community about professional practice are changing over time. Early career scientists, including graduate students and postdocs, are reportedly enthusiastic and place more value on broader impacts activities (Risien and Falk 2013; Storksdieck et al. 2017; Risien and Nilson 2018). This emerging openness to reaching beyond peers as the sole audiences of one's research activities is developing in parallel with other shifts in norms of the scientific community. For instance, over the last two decades, the advent of team science has shifted interdisciplinary and transdisciplinary science from a novelty to accepted practice (National Research Council [NRC] 2015). Similarly, scientists who engage the public, once looked upon with suspicion by their peers, are increasingly applauded for strengthening the link between the research enterprise and society (Lohwater and Storksdieck 2017). Scientists who are successful in their discipline and achieve notable societal impacts have three things in common. First, they blend disciplinary strength and passion with a deep conviction and commitment to broader societal impacts. Second, they draw on a rich set of partnerships that enable them to engage in practices likely to have meaningful impacts. Finally, their professional identity expands well beyond their discipline or the confines of their research topic. They are able to knit together disciplinary ties, personal relationships, intellectual contributions, and passion for science along with their other interests and strengths to achieve meaningful impacts.

The concepts described above in the process of unveiling one's impact identity have been applied in a handful of workshops of varying length. Evaluations of workshops indicate that researchers experience immediate value, including reduced fear and confusion about broader impacts requirements, expanded understanding of possible broader impacts activities, and excitement for developing a broader impacts trajectory that resonates with them both personally and professionally. There is much to learn about the potential of this systematic identity-based approach. Additional tests of the concepts, iterations of workshop design, formative assessment, and a longitudinal study of participating scientists can contribute to better understanding about the benefits of the approach and help to guide investments of researcher time and institutional resources. We hypothesize that using impact identities as a central organizing principle in developing career-long broader impacts yields benefits to scientists, the public audiences they engage, and enables one to strategically build on modest beginnings of broader impacts efforts.

Enthusiasm for engaging with broader impacts, increased desire for integrating work and life, and a drive to gain competitive advantage in the funding landscape may predispose early career scientists for maximum benefit from impact identity work. However, reports from the NABI community confirm that seasoned scientists are increasingly working to integrate broader impacts into their professional portfolios as well, and may also benefit from dedicated time to unveil their own impact identities, if only to become more deliberate mentors to their younger colleagues.

The NABI community has embraced the concept of impact identity in the trainings they provide to researchers and the professionals that support them. Social science research on NABI as a community has revealed critical practices, which include helping scientists in engaging non-peers in their research, helping scientists imagine ways in which their research supports broader societal goals, and brokering relationships and partnerships required to conduct broader impacts activities aligned with societal needs (J. Risien, submitted for publication). Trained to think within a scientific discipline, and subject to processes of reward and recognition that prioritize research outputs, scientists develop strong disciplinary identities that can isolate them from other sectors of society. Such isolation may stymy development of the skills and partnerships needed to generate a meaningful broader impacts portfolio. This can lead to the common stereotype that the only thing that matters in science is full dedication to research itself, at the expense of all other considerations. The scientific community is fighting this stereotype since it is seen as a barrier to attracting or retaining talent uninterested in a unidimensional identity, as researcher for research sake, and instead prefers to express a multi-faceted identity and incorporate strong societal connections in their professional lives (Eccles and Wigfield 2002; C. Stylinski et al. submitted for publication). At the same time, this stereotype is still part of the lived experience of far too many graduate students, postdocs, and other emerging scientists (Risien and Nilson 2018).

Retaining scientists from underrepresented groups in an effort to broaden participation and productivity of science will require many systemic shifts. Approaching this work from a place that recognizes the importance of allowing individuals to develop an identity as scholar and citizen will tap into ongoing

efforts to improve conditions for underrepresented scientists. Programs like NSF ADVANCE prioritize work–life integration, and universities are beginning to hire faculty with position descriptions that explicitly support public engagement. Departments across many universities are already updating their promotion and tenure guidelines to more meaningfully include and assess public engagement (Risien and Nilson 2018). Consequently, we posit that widespread adoption of the concept of impact identity may have implications for the recruitment and retention of a more diverse range of scientist, and ultimately serve as a practical tool to address longstanding concerns about a better integration of science into society (Weingart and Lentsch 2008; Hockfield 2018; Holt 2018).

Conclusion

Just as the boundaries between science and society change, identities are malleable and can shift. They evolve alongside changing norms of conduct and transforming expectations around what counts as success in science. We propose that unveiling impact identities, articulating impact specific goals, and developing long-term plans are critical to broader impacts success and for a satisfying career as a scientist. This entails integrating the many dimensions of a scientist's identity and the many contexts within which scientists conduct their work: their personal preferences, skills, and abilities; disciplinary affordances and scholarship; institutional homes; and the communities they are part of all shape how researchers position their science within and outside of academe. The use of impact identity as a framing concept for professional development holds promise to improve the reach and effectiveness of institutional infrastructures and professional support systems that work to better connect science and society.

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