

How university scientists view science communication to the public

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Background

Over the last two decades, scientific institutions have been making valiant efforts to increase the appeal and credibility of scientist participation in outreach programs. Since 1997, when the U.S. National Science Foundation (NSF) established new Merit Review Criteria, calling for all proposals for NSF funding to demonstrate their 'broader impact' on society, there has been no substantial evaluation of its success. Little is known about the present status of scientists' attitudes toward public engagement of science, or institutional barriers preventing such engagement since NSF's implementation of this so-called "criterion II"¹.

In 1985, prior to the new criteria, Dunwoody and Ryan conducted a national survey of scientists to ascertain their outreach practices and their perceived level of support by their respective institutions. This survey revealed one of the main inhibitors to outreach efforts: scientists did not feel an institutional responsibility to engage with the public. Additionally, scientists indicated that there was insufficient training and no reward system for public engagement activities². Indeed, this showed true in 1992 when Carl Sagan's nomination to the National Academy of Sciences was voted down. Although a leading planetary scientist, his time spent in the public spotlight was most likely the cause of his withdrawal³. It was apparent that the scientific community devalued public engagement by scientists.

In 1997, just before the implementation of the new Merit Review Criteria, then Director of the National Science Foundation, Neal Lane said, "I believe that the new leadership needed from those of us in the research community--particularly from individual scientists and engineers active in research--is to carry our understanding of science and its value into the lives of all Americans"⁴. The broader impacts criterion became a vital component of the NSF funding process.

Currently, little is known about the status of U.S. scientist's attitudes toward public engagement of science, or institutional barriers preventing such engagement. However, several local attempts have been made to assess the changing culture. The only published assessment looked at the results of a 2005 survey of 73 scientists in Colorado which showed little change: while scientists saw value in engaging in outreach activities, their departments did not. Not surprisingly, the participants listed lack of information regarding outreach opportunities and lack of departmental support as two of the major barriers⁵. Of further interest, the study focused on scientists who *already* engaged in outreach, as the investigators received few voluntary responses from scientists not involved in outreach activities. These results highlight the need for larger studies, such as the national survey the authors intend to deploy to US universities over the coming year.

The Role of Universities and Research Institutions

These surveys suggest that a lack of departmental support and inadequate institutional infrastructures prevent scientists from engaging in outreach activities. One researcher suggests that this is due to the absence of a larger, national science communication framework. Bruce Lewenstein discusses the value of having a single database of activities to assist those beginning endeavors in outreach⁶. Now that the NSF recognizes the

need for scientific outreach, it is time for scientific institutions to incorporate outreach activities into their research practice as well.

In fact, in 2007 Alan Leshner, Chief Executive Officer of the American Association for the Advancement of Science, stressed the need for institutional involvement: "Many [scientists] even feel that the culture of science actively discourages them from becoming involved in public outreach, because it would somehow be bad for their careers." Leshner calls for science centers and universities to take the lead in outreach activities, providing a structure and outlet for scientists to engage in these activities. He proposes two recommendations: first, an addition to the scientific rewards system that incorporates public engagement, and second, the establishment of university training programs in communication for graduate students⁷.

Leshner is not alone in his assertion that institutions should play a larger role in facilitating outreach. At the Public Communication of Science and Technology-8 Conference in Barcelona in 2004, the Spanish representative from Instituto de Astrofísica de Canarias stated:

The Leaders of this Cultural Revolution should be the science centres and universities. These centres are the deposits of the knowledge we are trying to transmit, and it is in these places where scientific advances take place. Expecting the public, administration, business, or the media to begin this process is the same as asking one to share what one does not possess"⁸.

In the same paper, Sáez suggested that a full 3% of an institution's research budget should be earmarked for outreach. This echoes the allocation of funding toward "social and ethical issues" by the Human Genome Project and various nanotechnology development initiatives worldwide⁹. Nielsen's survey of Danish scientists also indicates support for 2% of total research funding nationally to be allocated to science communication¹⁰.

Though many administrators in institutions hold similar beliefs, and a number of institutions have appointed deans or provosts for outreach activities, anecdotal evidence suggests that scientists in the United States do not yet have the support they need to engage in outreach activities. We believe much can be learned from our European counterparts. In 2005, the European Union (EU) held a Science and Society Forum to determine better strategies for public communication, as well as to discuss the further development of incentives in the academic setting. The EU followed the meeting with a call for proposals up to €200,000, to bridge science and society¹¹. A similar forum was held in the United States in early 2007, but led to few specific follow-up activities¹².

In addition to the EU's Science and Society Forum, the Royal Society of London conducted a survey on "Factors Affecting Science Communications by Scientists and Engineers"¹³. Some of the key recommendations based on the survey results include more clarity on the definition of public engagement, development of academic incentives and training sessions for undergraduates and graduates.

Many of the EU academic institutions as well as professional societies consider public communication of science a top priority. Even there, however, the evidence is mixed. The Danish parliament, for example, in 2003 formally established "science communication" as an obligation on par with teaching and research. A recent survey of Danish university-based scientists suggested that nearly half of the scientists believed it was their individual obligation to communicate, while only about 20 percent believed the obligation to reside with university administration¹⁰.

In recent years many colleges and universities in the U.S. have increased the attention they pay to outreach. But no clear models have emerged about how to organize outreach. Colleges and universities seeking to create outreach programs or organize existing programs in more efficient ways regularly call program officers at the National Science Foundation, staff officers at scientific societies such as the American Physical Society,

and the American Association for the Advancement of Science, and senior staff at major science museums to seek advice. Some scientific groups, such as the Consortium of Universities for Research in Earthquake Engineering (CUREE) have started collating for their members advice about how to engage in outreach.

It has been 10 years since establishment of criterion II, and we must now assess whether U.S. scientists consider public engagement a top priority as well. Does the U.S. still have institutional barriers to public engagement? Do U.S. scientists know about outreach opportunities? Are there training programs available to them? A national survey is needed to assess these questions, as well as a conference to discuss the findings and next steps toward making the U.S. scientific enterprise more engaged with the U.S. public. In this report we share how university scientists view science communication to the public, and report findings from a preliminary survey of faculty from one University, in preparation for national survey deployment to more broadly assess U.S. research scientists' views on public engagement.

Objectives/Method

To assess whether U.S. scientists consider public engagement a top priority, we implemented a survey (with permission, modeled on previous work by the Royal Society of London), to lay the groundwork for a national survey

- to determine the relative importance of science communication to university scientists and engineers
- to reveal what factors facilitate or impede communication of science to the non-specialist public on communicating their research
- to provide evidence to substantiate where resources should be targeted and to help develop programming for innovative and effective public engagement

Our version of the survey was reworded and modified for a US audience, and shortened to increase response rates. A pilot survey of 23 faculty members was initiated to determine if they are supportive of engaging with the public about their research and to examine potential institutional barriers that may be preventing such efforts. These life sciences related faculty were carefully selected to represent the spectrum of the University in gender, ethnic and racial origin, colleges, departments, faculty position levels, and funding agency support. The pilot survey results from 18 faculty in 11 departments (a 78% response rate) provided many needed changes to the survey format. Responses to many open ended questions guided the selection of choices and shaped the final wording of survey questions. It also allowed the authors to correct questions for differences in perceived meanings, as well as add clarification for potentially confusing questions.

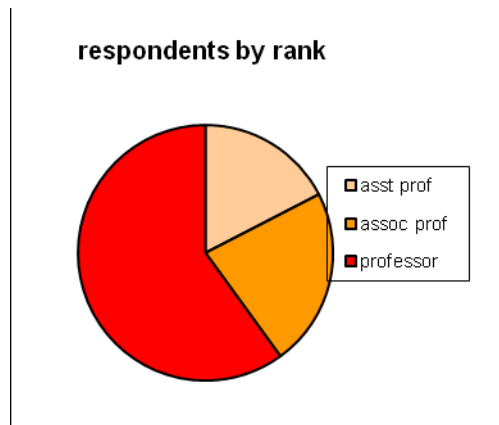
The final survey, entitled "Public Engagement: Science Communication" was disseminated online through the Survey Research Institute, a full-service survey research facility at Cornell University. It was open for 41 days and included one reminder to least disturb faculty. It was deployed to all faculty in departments located on the Ithaca, NY campus that housed any life scientists (total=914, which excludes the Medical College in New York City). The Office of the Dean of University Faculty provided email addresses and department affiliations for each of the 914 faculty members. The survey was introduced via an electronic letter originating from the Vice Provost for Life Sciences at the University, including a cover letter with instructions and expression of appreciation for filling out the survey.

Results

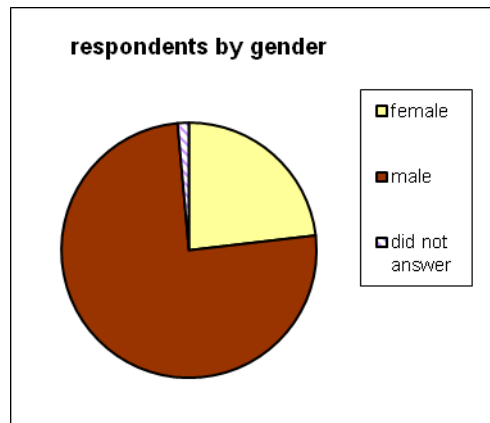
The total sample size includes 350 life sciences related faculty at Cornell University, corresponding to a 38.29% response rate. The single reminder email that was sent out did increase the response rate. The average completion time was 12 minutes.

About the respondents

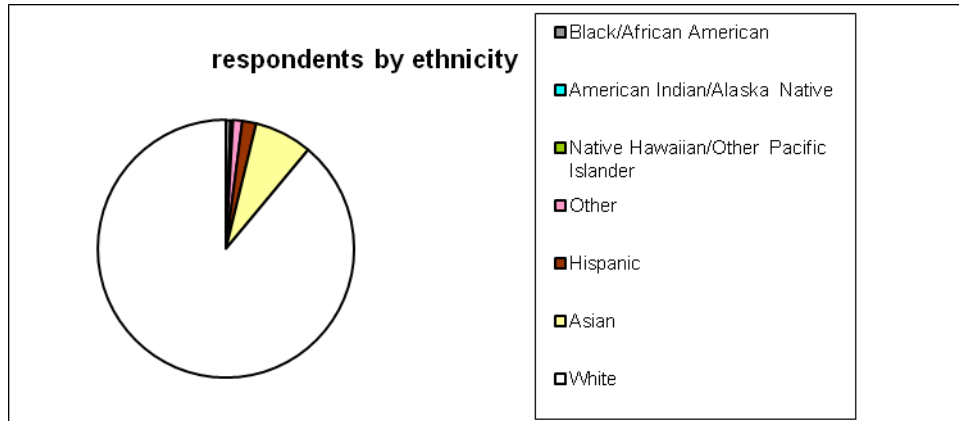
The faculty responding to the survey closely reflected the demographics of the University as a whole. The population of survey respondents includes a majority of males and full professors, which nicely corresponds to the University faculty population. Sixty percent of the survey respondents were Full Professors (compared with 59% University-wide), 22.6% were Associate Professors (vs. 25%), and 17.4% were at the Assistant Professor level (compared with 16%).



The respondents were 76.6% male, which closely reflects the Cornell University faculty population as a whole (76%).



University-wide 87% of the faculty declare themselves as white compared with 87.4% of the survey respondents.

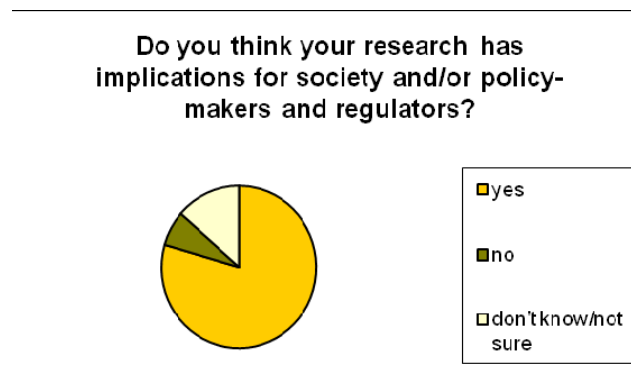


In addition, 80.8% of the respondents declared English as their first language.



Why is science communication to a general audience important? And why do faculty participate in science communication to the public?

The survey results show that many Cornell faculty members believe that communicating science with groups outside the science community is important. Additionally, faculty state they are participating in some form of public science communication. Seventy-nine percent of respondents believe their work has implications for society (about 13% don't know or aren't sure).



Respondents also felt that it was "important" or "very important" to engage with these audiences in particular topics, the most popular of which were to recruit/engage the next generation of scientists (87%, 55.3% of

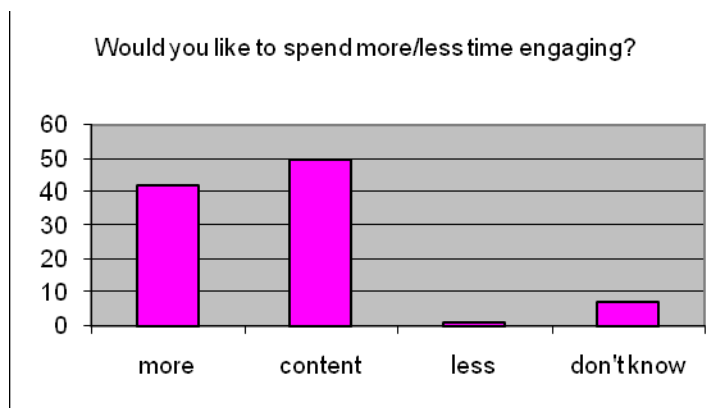
whom responded "very important"), enjoyment/excitement of science (79.2%, of which 43.9% marked "very important"), potential benefits/implications of work (71.1%, one third marked "very important"), and scientific process/nature of science (70.7%, 36.8% indicated "very important"). Less commonly marked topics of importance, though still majorities, included: particular research findings (66.4% marked "important" or "very important"), areas for future research (64.1%), scientific uncertainty (62.6%), and policy/regulatory issues (62.5%).

Not surprisingly at an educational institution, 81% of faculty engage to inspire others and promote science, but also 90% think it is important to inform, educate and counter misperceptions. The third most cited reason to engage is to influence policy (59%). A majority (57%) also engage due to expectations or requests such as through extension services or NSF requirements. The least often cited reason to engage with the non-specialist public was to improve public relations (39%).

Survey respondents believe it is important to "personally engage" with a variety of non-specialist groups, the most popular of which were policy-makers (68.4% marked "important" or "very important") and science journalists (66.6% marked "important" or "very important"). Other audiences of perceived importance are schools/teacher groups (61.7%), the non-specialist public (60.9%), general media (58.5%), alumni (57.6%), and industry/business groups (55.9%).

How well equipped are faculty to engage?

In addition to perceiving the importance of these roads of communication, Cornell faculty survey respondents generally believe they are participating in some form of science communication. Although 49% of respondents are comfortable with the amount of time they currently spend engaging with non-specialist groups, 42% report that they would like to spend more time.

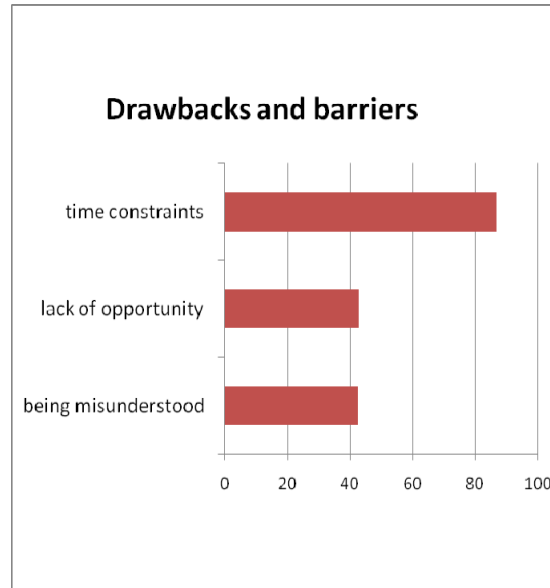


Although only 18% of respondents report feeling "very well-equipped" to engage with the non-specialist public about their research, 52% do feel "fairly well-equipped" to do so. However, 75% have had no formal training in communicating science to the non-specialist public.

Of those who indicated having had formal training in communicating science to the non-specialist public, 11.4% had media training on being interviewed by journalists, 10.3% were trained in speaking, 7.1% in writing, and 6% in speaking to school children. Anecdotal evidence shows an increased interest in media training among the faculty. When a half-day media training workshop was recently offered to a small group of University faculty, the openings were filled within minutes of the email offer.

What are some drawbacks or barriers to scientists generally engaging with the public?

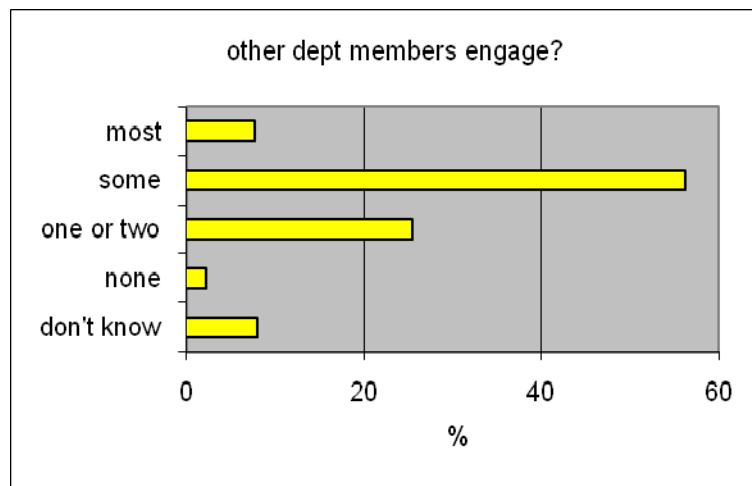
Although the survey indicates strong support for science communication with the lay public, the respondents still experience many barriers to these efforts. Overwhelmingly, time constraints are the biggest reason faculty do not engage even more (86.6%). The majority of respondents did not agree on other drawbacks or barriers. However, faculty did note other barriers including a lack of opportunity (42.9%) or being misunderstood (misquoted, misconception, distortion) (42.6%).



Faculty also stated reasons for limiting their involvement with public engagement. Approximately 70% said they need their time for other work-related activities such as research or teaching, and 37.4% feel they are already adequately involved. Only 1.4% believe it is someone else's job to communicate science, about 6% are not interested in engaging, while 7.1% feel they are too junior. In addition, 14.6% feel they lack senior level support, and 27.1% indicate there is not enough funding.

How engaged are Cornell University scientists with science communication to the public?

Fifty-seven percent of faculty scientists and engineers feel their college is supportive or very supportive towards researchers who take part in activities to engage the non-specialist public in science. There is a general perception that most or some of their colleagues (64%) within the department take part in those activities.

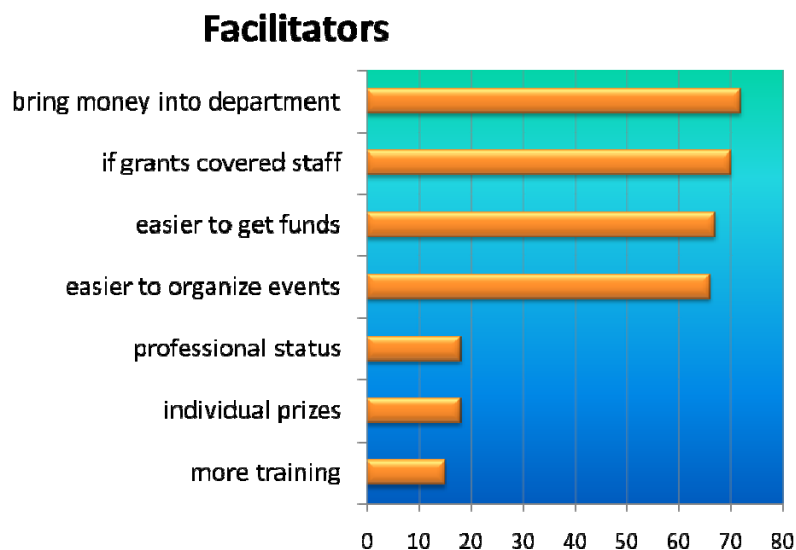


Respondents reported with considerable frequency having done each of the following types of activities listed at least once in the past year: worked with teachers/schools, participated in an institutional open house, participated in public dialogue/debate/lecture, been interviewed on radio/TV, written for the general public, engaged with policy-makers or NGOs, worked with science centers/museums, or judged competitions. When asked how often in the last 12 months they had actually engaged with the public, 91% of faculty reported having taken part in at least one science communication or public engagement activity. This is significantly higher than the 74% reported by the Royal Society survey on which this survey was modeled. Faculty respondents estimated 3225 total interactions, the most frequent being interviewed on radio, TV, or by another journalist (n=533)--25% have been interviewed 2 or 3 times. Engaging with policy makers (n=431), taking part in a public dialogue event, debate or lecture (n=421), or working with teachers/schools (including writing educational materials) (n=405) were the next most common forms of public engagement activity. About a third have communicated with NGOs or policy-makers at least once in the past 12 months and only 20% reported having worked with a science center or museum.

Overall, this represents an average of over 9 public engagement interactions per year per faculty. Ninety-one percent are content with the amount of time spent or would like to spend more time engaging with the non-specialist public about science, and 28% have done so at least once per month throughout the past year.

What facilitates these interactions?

Faculty chose the following top selections when asked what would personally encourage them to get even more involved in activities to engage the non-specialist public in science and engineering: bringing money into the department (72%), covering staff time with grants (70%), obtaining funds with greater ease (67%). Additionally, 66% of faculty said they would participate more if it were easier to organize public engagement events. Interestingly, the bottom of the incentive list to facilitate science communication included helping to gain professional status (18%), earning awards or prizes for the individual (18%), and (more) training (15%).



Seventy-four percent of scientists and engineers at Cornell University disagree that their research is not interesting to the public and 70% disagree that their research is too specialized. Seventy-six percent in fact feel it is their moral duty to explain the implications of their research and 71% would be happy to participate in a science engagement activity organized by someone else. Two thirds of the respondents feel it is personally rewarding, and 63% feel funders of scientific research should help scientists to communicate with the non-specialist public.

These results suggest that Cornell faculty see the importance in communicating about science and engaging non-specialist audiences in science topics. Further, faculty have high levels of participation in some form of science communication. Despite the drawbacks and barriers perceived by the faculty, it appears that the reasons for engaging in science communication outweigh the negative perceptions.

Conclusions

This research challenges the perceived notion that scientists are disinterested in (and even hostile to) public engagement. In fact, the preliminary survey of 350 Cornell University faculty suggests that university-based science researchers are both supportive of others and eager to engage themselves in outreach. Although this information is positive, many of the same barriers emerged as previous surveys have shown. The project team is currently expanding this survey to include a larger sample of U.S. scientists in academia with plans to discuss the results at a conference with university administrators. This project hopes to expand our knowledge about the motivators and barriers to public engagement of science, as well as make recommendations to improve outreach activities in the academic setting for university administrators. Inclusion of more responses from faculty not supportive of public engagement will also be informative.

It appears from this survey that a majority of Cornell University scientists are willing, interested and active in communicating their research findings to a general audience. It is worth noting, though, that Cornell has an institutional structure in place to facilitate such engagements. Being a land grant university with a mission to disseminate information, as well as having an associate provost for outreach, may increase the number of activities available as well as interest in science communication. Still though, the study suggests that scientists are not the barriers to science communication engagement, as shown in past surveys. It is possible that

NSF's implementation of criterion II has influenced scientist's perception of public engagement of science over the last few decades. It is equally as possible that university administrators are responding to Criterion II by creating institutional structures supporting such outreach efforts. The small sample size and use of one university in the survey does not allow the authors to generalize. The results collected, however, provide useful recommendations for the implementation of a national, U.S. survey.

The authors hope to deploy a national survey over the next year. As inferred by the current study, the national survey will include the possibilities of the institutional context helping to facilitate the process of science communication. Although interest in science engagement is high, time constraints still exist. The active encouragement from university administrations may provide the necessary support to increase scientist's involvement. Additionally, the national deployment of the survey will shed better light on differences between gender, ethnicities, rank and disciplines. The most important function that the national survey will shed light upon is the potential culture change since the implementation of NSF's criterion II. If the Cornell survey is any indication of the culture shift in the United States, then not only has NSF succeeded, but it has also changed the future for the study of public engagement of science. This might be the most exciting decade for the public engagement of science.

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