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Embracing Advocacy in Science

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Abstract

Scientists have the unique knowledge and insight to advocate for science-based policy. Scientists are poised to be effective advocates, because they understand the process and power of science. Yet, a perception remains that scientists cannot be objective and credible while also advocating a position that may inform or impact decision making. We counter this notion and make the case that scientists should engage in science communication and advocacy. We define advocacy as arguing for a position that has the support of verifiable facts, and may be used to influence decision making or effect policy change. We present a historical context for current science-policy and advocacy paradigms and suggest guidelines, based on our collective experiences, for engaging in science communication and advocacy. The guidelines presented are applicable to scientists and professionals across disciplines — including graduate students — and can be used either as a private citizen or representative of an institution.

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Scientists are often faced with the dilemma of how to advocate for policy issues while maintaining professional objectivity and credibility. We believe that all citizens have a responsibility to engage in the political process, and scientists in particular have training in and experience with the scientific process, and expert knowledge that can help guide decisions on many pressing contemporary issues. We understand the important role that science has played, and can play, for bettering society as a whole. Involvement in both research and advocacy therefore do not need to be mutually exclusive. Advocating for science-related issues should not be a conflict of interest, but a necessary step toward a more holistic scientific method and a more informed society. Public policy is strongest when it is informed by sound science. U.S. Senator Chris Coons made this clear in his editorial from the August 4th edition of *Science* (Coons 2017). Sen. Coons stressed that scientists should publicize their work, make the case for science with the public, fight for scientific literacy, advocate for STEM education, and reach out to elected officials to explain why science matters. The challenge we face as scientists is how to embrace that responsibility and act as advocates without diminishing our professional credibility or the public's trust in our work.

Advocacy, as defined by the AFS advocacy guidelines (AFS 2017), is arguing for a cause or position, often on behalf of others. Pool et al. (2017:358) further acknowledged that advocacy can provide "a rational basis for decisions...including the use of sound scientific principles to support policies, courses of actions, or management decisions…." We combine these two viewpoints here, and define advocacy as arguing for a position that has the support of verifiable facts, and may be used to impact decision making or affect policy change. This commentary is intended to encourage scientists to engage in science communication and advocacy, with the goal of advancing decision making and policy that is informed by results of robust scientific inquiry. We recognize that advocacy can be a double-edged sword, sometimes wielded by those with ulterior motives. We encourage our readers to pursue or

support advocacy positions with well-supported and scientifically-sound information. We implore scientists to use their best judgement, and make sure that advocacy positions and statements are objective, clear, honest, complete, transparent, and backed by the best available science.

Although scientists tend to welcome discussions of scientific findings with peers, some shy away from public advocacy for fear of public backlash or unintended political consequences.

Yes, there is public and political conflict over the role of science in modern-day American policy and decision making (Hughes 2017), but political manipulation of scientific discoveries is not a new phenomenon (Ruch 2017) and should not preclude scientists from forays into public discourse. History is replete with examples of successful efforts to engage with the public on controversial scientific topics. The early twentieth century saw public upheaval over Darwin's theory of natural selection, Einstein's ideas on general relativity, and Hubble's conclusion that the universe is expanding. Einstein and Hubble became celebrities of their day, garnering public attention largely *because* of the controversy over their work. With the right delivery, we can capitalize on the public's interest in scientific discovery and debate, and perhaps energize society to pursue new frontiers.

At the turn of the twentieth century, scientific research was largely funded by private donors. Scientists attracted funding by disseminating their work and clearly communicating its significance to donors. World War I, World War II, and the Cold War drove the U.S. into an arms race, underpinned by a science race, which drove the federal government to dramatically increase funding for basic and applied research starting in the early 1950's. The National Science Foundation was created by Congress in 1950 to advance scientific research, following the first Russian atomic bomb detonation in 1949. Federal funding for research and development increased by over 400% from 1951 to 1961 (compared to a 12% increase from

2007 to 2017; AAAS 2017). With federal tax dollars flowing to universities, many academic scientists focused on working within their institutions, without an emphasis on public communication. It became an accepted element of the profession to segregate science from advocacy in order to remain objective (Otto 2016:114). With the fall of the Soviet Union in 1991, the science and arms races slowed, and federal funding for basic research was subsequently cut or reprioritized for medical advancements in the mid-1990's (AAAS 2017). A host of social and economic issues, including health care, immigration, marriage equality, and loss of manufacturing jobs occupied the nation's attention (Pew Research Center 2011), shifting focus away from environmental and other scientific issues (Dykstra 2008).

There are, however, examples of scientists who took their findings beyond their immediate peers, acted as advocates for their work, and effected positive, lasting policy changes for society. In 1962, Rachel Carson's seminal book *Silent Spring* exposed the dangers of chemical pesticides on the environment and on human health (Carson 1962; Skerrett 2012). Carson's prose and anecdotes effectively communicated complex concepts to the public and policymakers, eventually leading to a ban on DDT in 1972 (U.S. EPA 1972). At the same time, Claire Patterson and Herbert Needleman raised concerns that atmospheric lead concentrations were causing brain damage in children (Needleman 2000). Both scientists testified at government hearings and actively worked to counter the narrative pushed forward by the lead industry until a ban on leaded gasoline was implemented in 1996 (Shabecoff 1985; U.S. EPA 1996). In 1974, Sherwood Rowland and Mario Molina discovered that chlorofluorocarbons were degrading the ozone layer of the upper atmosphere and allowing elevated levels of harmful ultraviolet radiation to reach the Earth's surface, posing serious health risks to humans and other organisms (Crutzen 2012). Rowland became a leading advocate for banning chlorofluorocarbons, ultimately resulting in the 1987 *Montreal Protocol on Substances that Deplete the Ozone Layer*, which was ratified by all 197 parties in the

United Nations, making it the first to achieve universal ratification. In all of these cases, it took years of rigorous science and tireless advocacy to shift political opinion, and convince elected officials to acknowledge the weight of scientific evidence and implement the necessary policy solutions.

In the 1990's and early 2000's, the scientific community began to strengthen its commitment to effectively communicating science to a larger audience. Funding agencies now routinely require "broader impact" statements in research proposals and non-governmental organizations (NGOs), backed by large foundations, have become increasingly important sources of support. If science is to be relevant to policy and society, it must be heard, understood, and valued by broad and diverse audiences. Scientists generally need to improve communicating information and the broader societal and economic implications to the public. This is especially true for communicating with politicians and other decision makers — we cannot assume that decision makers will intuitively understand the nuances of scientific inquiry or the important connections between scientific discovery, social and economic benefits, and strengthening public policy (Margraf 2017; Pool et al. 2017). We therefore urge you to share your science broadly, and engage in open and honest discussions that can inform and strengthen policy. Some have argued that scientists have a professional duty, and even ethical obligation, to do so (Hughes 2014; Fraidenburg 2017; Hughes 2017 and references therein).

Advocacy can take on many forms and can be done in a variety of forums, either for your own work or for work that encompasses a larger discipline. The following guidelines, gleaned from our collective training and experiences, are meant to illustrate the many ways in which scientists can advocate, actively and passively, for scientifically-informed policy. We focus on examples of opportunities that are available to students and early-career scientists (highlighting our own experiences throughout), but can be applied across career stages and

disciplines. We feel it is important for scientists at all stages of their career to be involved in science communication and advocacy. These guidelines are certainly not mutually exclusive, and there are many ways in which they can be combined and applied to form a personal science communication and advocacy strategy; your strategy may change over time as experience or career dictate. We further recognize that not all of these actions will be feasible for everyone, either personally or professionally, and some may need to be conducted as a private citizen. If acting as a private citizen, make sure you are explicit that your views are your own, and do not represent the views of any specific organization or institution. With all of the below guidelines, there exists a professional obligation to be transparent in your motivations; to bring the best available science into decision making no matter what the issue; to separate professional opinion from accepted knowledge or fact; and to be objective, complete, and truthful in presenting information (Hughes 2014; Fraidenburg 2017; Reiser 2017).

1. Gain experiences working with a variety of activities and organizations. Skills that are transferrable to science policy and science communication can be gained through a variety of experiences outside of the classroom or workplace. Experiences that build leadership, team building, management, problem solving, and communication skills take on many forms. We have taught at youth science camps, volunteered at science festivals, participated in door-to-door canvassing, coordinated graduate student research symposia, served as officers in our department's graduate student organization, and served with our university labor union. These experiences have been both as private citizens or as representatives of our department or university.

2. Join a professional society that already plays a role in advocacy. Professional societies like the American Association for the Advancement of Science (AAAS) or AFS, often have existing bylaws and procedures in place for issuing position statements and recommending policy action; there is already a vetting process in place that ensures any position is thoroughly researched and backed by credible evidence. In the case of AFS, for example, the process involves expert scientific and technical review, considering alternative viewpoints, garnering significant member support, and considering the potential to make a difference with advocacy actions. The Office of Government Relations at AAAS tracks science funding, provides objective information to Congress on current science and technology issues, connects members to their representatives, and provides resources for scientists to be effective when communicating and working with Congress. By being a member of these and other professional societies, you can contribute to meaningful advocacy and policy actions without having to advocate directly or actively on your own.

3. Become involved with local or national chapters of conservation-minded NGOs, trade organizations, or general membership groups. Grassroots organizations have played a pivotal role in connecting the public to scientists and to policy. There are many nationally and internationally-recognized groups that have state, county, and city-level chapters. These are crucial liaisons that are always open to taking on volunteers. Local NGOs may also have programs for scientists to give brief presentations to the public on their work or more general science topics. Advocacy opportunities also exist within trade organizations like the American Sportfishing Association, or general membership groups like The Nature Conservancy or National Wildlife Federation. Similar to the guidelines above, a variety of communication, organizing, and advocacy skills and insights can be gained from working with such organizations.

4. Be proactive in communicating science. Talk about your science often, in different media, and to many different audiences. Every interaction is an opportunity for outreach and education, if you remain modest and respectful; remember that people are naturally curious, but that they can easily become defensive. Whether at the dinner table, dog park, or a science festival, opportunities to talk about science are opportunities to educate and practice your communication skills. Simply communicating what a specific agency or institution is responsible for (e.g., predicting weather and storms, managing natural resources) can be a segue into a conversation about a particular field of study or the importance of incorporating scientific findings into decision making.

Submitting an opinion letter or letter to the editor for a local newspaper — either as a representative of your institution or as a private citizen — is a great opportunity for practicing science communication. The professional editors of media outlets will help you develop a compelling message that will resonate with their readers. Such publications have credibility with lawmakers and demonstrate the relevance of an issue to a local, regional, or national voting base. We, for example, have published op-eds on the Congressional Climate Solutions Caucus, establishing an ocean trust fund, and the state of science under the current administration. If professional anonymity is a concern, you could publish using a pseudonym.

For an even broader reach, take advantage of the existing cadre of social media and internet outlets, such as Twitter, Facebook, LinkedIn, and blogs. Many scientists, non-profit organizations, professional societies, government agencies, and journalists communicate scientific findings and policy implications through these outlets. You could share such posts within your own personal or professional networks.

5. Engage in dialogue with decision makers. Reach out to decision makers at all levels — local, state, and federal. Attend town hall meetings, speak to elected officials, and submit public comment on proposed policies. Elected officials often maintain public contact information and meeting request forms on their websites. Call, fax, write letters or emails, and meet with elected officials in person to voice your concerns, talk about how science can be used to inform policy, and why you support policies that are based on sound science. Faxes are effective because they *must* be read by the office. Remember that you are an expert in your field, and have valuable knowledge and experience to offer. Be clear and concise in the position or policy that you are advocating. Make the connections between science and policy explicit; do not leave it to your audience to intuit these relationships. In these conversations, it may help to gently summarize why the science is important for understanding an issue, or the general methods used to reach a conclusion.

Communicate science-based solutions using the "problem-solution-ask" approach recommended to us by professional lobbyists: summarize the key elements of the problem to be addressed, present a reasonable solution that clearly resolves the problem, and ask for a specific action to carry out the solution. References for how to frame policy discussions can be found through outlets such as AFS Policy Letters (https://fisheries.org/policy-media/policy-letters/), AFS Policy Statements (https://fisheries.org/policy-media/policy-statements/), and the AAAS Advocacy Toolkit (www.forceforscience.org/toolkit/).

We have utilized meetings with members of Congress to stress the importance of science-based solutions to state and national issues. For example, we met with nine elected officials from Florida during the Blue Vision Summit in 2017 and 37 elected officials during Capitol Hill Oceans Week trips in 2013 and 2016. We went to these meetings prepared with clear "asks" and informational handouts to leave behind, including background information, lists of related House and Senate bills, and our contact information. Sometimes the simple

offer to be an available expert resource opens important doors; we have stayed in touch with our representatives and their staff to provide our professional input when new ocean science-related bills have been announced.

6. Gauge interest among colleagues. Ask colleagues about potential courses, seminars, webinars, conferences, or workshops they would like to participate in. For those in academia, reach out to faculty or other professionals who could develop and teach these courses, or spearhead one of your own. For example, we cultivated our policy engagement experience by taking an Ocean Policy course at the University of South Florida — a course largely motivated by students' interests. This course was led by Dr. Frank Muller-Karger, one of the 16 members of the U.S. Commission on Ocean Policy appointed by President George W. Bush. Students personally met with many lawmakers, learned how to communicate with them, and were encouraged to advocate for science-related issues. The class also focused on teaching students how to write successful op-eds related to science policy (see #4 above). The course culminated in student-organized and student-led trips to the Florida capitol and to Washington, D.C. for Capitol Hill Oceans Week, during which we visited with legislators and participated in meetings and lobbying efforts.

7. Build and use your network. Seize opportunities to network in both formal and informal settings. Follow up with new contacts soon after your first meeting and offer to be a resource, especially for elected officials. Use your network to find other scientists or advocates who are interested in or already working on similar issues. These contacts could stem from social media or involvement with an NGO, trade organization, or professional society (see #2 and #3 above). Invite researchers, journalists, authors, or politicians to speak about their experience and expertise at your institution; this is a great way to learn about issues and to

discuss possible policy alternatives. For example, David Helvarg, an author, journalist, and Executive Director of Blue Frontier, met with students and gave a seminar at the University of South Florida in the fall of 2016. His encouragement led us to secure funding and organize a trip to Washington, D.C. for the Blue Vision Summit and Healthy Oceans Hill Day in May 2017.

8. Apply to formal opportunities for communication training and professional development. Apply to opportunities at all levels from local to international, and through all stages of your career, to gain experience with science communication, policy, advocacy, writing, and outreach. There often are fellowships or internships available through state Sea Grant programs, the State Department, or the National Academies as well as other organizations and professional societies that promote scientifically-informed policy, such as National Geographic, the Ecological Society of America, or AAAS. Continuing education workshops and webinars through professional societies (like those offered at AFS Annual Meetings) are also a great way to develop and refine these skills. These types of experiences might also be available through your department, college, or university.

9. Vote. Vote in local and national elections, both in the mid-term and general election cycles. Vote for officials who support science, science funding, and using science-based solutions in policy. Recent results in several state elections have demonstrated the power of voter turnout.

Being willing to communicate science to a broad audience and acting as an advocate for science are necessary to maintain public support for what we do, and ensure that policies are based on sound science now and into the future. We recognize that some of the proposed guidelines may be difficult or met with opposition, but we urge you to become more involved

in science advocacy however you can. Whether as a private citizen, representative of your institution, or member of a trade organization or professional society, there are many advocacy opportunities available to you. Just as a salmon swims against the current to achieve success, let us do the same.

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