



Think of the Early Career Researchers! Saving the Oceans Through Collaborations

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Oceans are complex systems and problems preventing a sustainable future require complex solutions. This can be achieved through innovative blends of natural and social sciences, with input from stakeholders. There is growing expectation that early career researchers (ECR), especially conservationists, should be more than natural scientists. ECR are expected to have skills in several domains, not all important to the quality of their work. Scientific skills range from knowledge of complex statistics to programming, and experience in different scientific fields. It is not only impossible to master all such tasks in a lifetime, much less as an ECR, but most importantly, attempting to do so means an ECR cannot master any single skill. This is especially true for minorities, non-native English speakers, and those who must juggle doing science with little or no funding, while having other jobs and family commitments. ECR are also expected to participate in activities that, while important for conservation, do not necessarily improve their scientific skills. These are social skills and range from policy engagement to science communication. This can contribute to developing mental health issues as it hinders having a healthy work-life balance. This expectation of engaging in extracurricular activities can overwhelm people with social anxiety and other difficulties with social interactions (e.g., people in the autism spectrum). Through collaborations, we can effectively draw on the more specialized skills of various people. Building an inclusive scientific community for ECR, therefore, calls for seeing diversity of skills, thoughts, and personality traits as its strength.

Keywords: academia, autism, mental health, multidisciplinary, science communication, ocean conservation

INTRODUCTION

Cosience is the principle that knowledge from different disciplines converge to form a comprehensive understanding of a theory or field. With this in mind, we see ocean conservation as a multidisciplinary endeavor that requires unification of knowledge from different fields. These range from biology, ecology, and evolution, to engineering, statistics, and psychology, and together should work to identify conservation challenges oceans face and the best approaches

for developing and implementing effective solutions. Thus, although marine conservationists are trained in a wide range of topics, expert input from other fields are crucial to prevent unintended negative consequences.

One famous case of adverse consequences resulting from attempting to solve a complex issue without input from experts from all relevant fields is “The Ocean Cleanup” project. This is an international project aiming to build a large floating device to intercept plastic debris on the ocean surface¹. Due to inadequate consultation with relevant experts, the environmental impact assessment was limited in their scope as well as conclusions (Zuijderwijk et al., 2014). The project was criticized by experts before, during, and after implementation^{2,3}, yet their concerns were dismissed⁴, resulting in putting vulnerable marine animals at risk⁵. These unintended consequences could have been prevented by appropriate consultation, and collaboration, with relevant experts at earlier stages.

Throughout this manuscript, we will provide examples and context to argue that ocean conservationists should strive to build a collaborative, multidisciplinary environment instead of expecting conservationists to be themselves jacks-of-all-trades. The expectation that conservationists, especially early career researchers (ECR), should have expertise on a range of fields can affect researcher and the scientific endeavor. It is detrimental for the scientific endeavor because having a range of knowledge is not synonym with being an expert in those fields. And it is detrimental for researchers because the expectation that researchers, especially ECR, must do more than “just” science not only contributes to burnout and other mental health issues, but is also a form of hidden discrimination due to a myriad of factors we will address in the following sections.

We focus on ocean conservation due to the multidisciplinary nature of the task, however, the topics we will discuss throughout this manuscript also impact ECR and academics from other disciplines, scientific or otherwise.

Jack of All Trades, Master of None

There is growing expectation that ECR, especially those working in conservation, should be more than scientists seeking to understand the natural world. ECR are expected to have skills in several domains, many that are important to the quality of the scientific research they produce, while others are not. Required scientific skills range from fieldwork experience and knowledge of complex statistical analysis to programming and experience using a range of specific equipment or software. It is not only impossible for one individual to master all such tasks in a lifetime, much less as an ECR, but most importantly, attempting to do so means an ECR cannot master any single skill. This is

especially true for minorities (e.g., non-native English speakers) and those who must juggle doing science with little or no funding, while having other jobs or family commitments (Hooker, 2020). Learning a new language, applying for funding, or attending other commitments, leave limited time to acquire new skills to increase career prospects.

We are certainly not arguing candidates who are not sufficiently qualified should be hired over a person with demonstrably more experience and knowledge. We are also not saying scientists should not seek to gain knowledge of fields outside of their area of expertise. We do argue that while knowledge about seemingly unrelated topics may be of significant value, becoming an expert is a life-long activity and expecting researchers to be themselves “multidisciplinary” (i.e., experts in a range of disciplines) can have detrimental consequences for the scientific endeavour as well as for researchers themselves.

SOCIAL SKILLS

“With me, though, there is no external sign that I am conversationally handicapped. So folks hear some conversational misstep and say, ‘What an arrogant jerk!’” – John Elder Robinson, 2008, Look Me in the Eye: My Life with Asperger’s.

Science communication training courses focus on a range of topics such as writing scientific manuscripts, speaking to policy makers or the media, and engaging with the general public⁶. These activities require skills in social communication, which include skills in using language, changing language accordingly when changing audience, and being able to follow communication rules (e.g., taking turns to speak, making eye contact). Social communication skills develop naturally as we grow older and can be enhanced with training; however, some children (up to 7.5%; Ketelaars et al., 2009) suffer from social communication disorder, which are comorbid with other conditions such as autism and attention deficit/hyperactivity disorder.

People with social communication disorder have difficulties during social interactions and to communicate with others, as they have difficulties understanding social rules, such as when it is their turn to speak or how to continue with the topic of conversation. These difficulties, however, need not to be reflected in other activities such as writing a scientific manuscript, which is a form of communication, and a crucial one for scientists and ocean conservationists.

There is increased recognition of neurodiversity in academia and elsewhere; however, all scientists are encouraged or forced to engage in science communication *via* different channels, some even suggesting that science communication should be rewarded for career advancement⁷. This position ignores the difficulties neurodiverse people may face regarding social communication,

¹<https://theoceancleanup.com>

²<https://www.theatlantic.com/science/archive/2019/01/ocean-cleanup-project-could-destroy-neuston/580693/>(accessed April 11, 2020).

³<https://www.deepseanews.com/2019/02/the-ocean-cleanup-struggles-to-prove-it-will-not-harm-sea-life/>(accessed April 11, 2020).

⁴<https://theoceancleanup.com/updates/the-ocean-cleanup-and-the-neuston/>(accessed April 11, 2020).

⁵<https://www.theguardian.com/environment/2019/oct/03/ocean-cleanup-device-successfully-collects-plastic-for-first-time> (accessed April 11, 2020).

⁶<https://www.unavco.org/education/professional-development/science-communication/science-communication.html> (accessed October 16, 2020).

⁷<https://watershednotes.ca/2020/01/29/how-should-we-reward-scientists-who-do-scicomm> (accessed May 16, 2020).

and indirectly values social skills and charismatic individuals. Rewarding specific social skills constitute hidden discrimination of neurodiverse conservationists both for promotion as well as in hiring practices, affecting especially ECR who have not yet built a professional network.

Appropriate behavior and use of language are crucial to building a welcoming environment; however, charismatic individuals can be problematic too⁸. One of the most famous examples of how charismatic scientists can hinder scientific advancement is Prof. Neils Bohr. Bohr was a Danish Nobel laureate who made significant contributions to particle physics. However, he also believed that the weirdness of particles' behavior says nothing about reality. He was a highly influential character who actively stopped scientists from working on understanding the reality behind particle physics, even to this day, due to his charming, enchanting personality (Becker, 2018).

In the following sections, we will discuss a series of conditions and factors that are often ignored in academia but can impair social communication skills, and the potential consequences of doing so. We intend to highlight academics suffer from these, but not to suggest they do so exclusively. We recognize these factors are many and wide, but expand on those we are more familiar with because of our personal experiences with them or those of people we know.

Autism Spectrum Disorder and Mental Health

“The worst part of having a mental illness is that people expect you to behave as if you don’t” - Joker (2019).

The two diagnostic criteria for autism spectrum disorder (ASD)⁹ are social communication deficits and repetitive behaviors, including a spectrum of traits. Spectrum means not everyone diagnosed with ASD has the same traits or the same level of severity, and while some require constant support others can live independent lives (Lord et al., 2018). Typical traits include little or no eye contact, having strong interest in topics, objects, or people, strict routines, dislike of physical contact, difficulties understanding sarcasm, and reduced emotional empathy (Lord et al., 2018; Shah et al., 2019). Furthermore, many conditions are usually co-occurring with ASD, including gender dysphoria, depression, anxiety, and other mental illnesses (Baldwin and Costley, 2016; Heylens et al., 2018; Lord et al., 2018).

Reduced emotional empathy can also be present in non-ASD people due to suffering from alexithymia (Kinnaird et al., 2019), a condition by which a person cannot recognize their own emotions and usually describe them based on physical symptoms (e.g., stomach discomfort). Alexithymia is co-occurring with ASD in nearly 50% of ASD cases (compared to 5% in neurotypical people; Shah et al., 2019). Reduced

empathy, in both autistic and non-autistic people, can lead to awkward moments or comments that can be interpreted as tactless or offensive. This may complicate working relationships, especially teamwork.

Early career researchers are in a more precarious conditions compared to senior scientists, not just regarding job security and opportunities for funding and collaborations, but also about their own knowledge and skills. Therefore, ECR with any of the conditions mentioned above will be specially impacted in an academic environment that expects them to master social communication skills to advance in their professional career. The pressure could discourage them from pursuing a scientific career but also lead to or worsen mental health issues of those already in academia.

The two most common mental health issues reported in academia are depression and anxiety (e.g., Sarokhani et al., 2013; Evans et al., 2018). The prevalence of anxiety and depression in graduate students is significantly higher than in the general population, with transgender and gender non-conforming students having the higher proportion (55 and 57%), followed by females (43 and 41%), and males (34 and 35%), respectively (Evans et al., 2018). On the other hand, those with a healthy work-life balance reported significantly lower levels of anxiety (24 vs. 56%) and depression (21 vs. 55%) (Evans et al., 2018). These issues may be present before or be unrelated to the academic environment (e.g., money and romantic relationship problems), but can be triggered or worsened in the usually stressful, unstable, and competitive environment (Furr et al., 2001; Gilbert et al., 2009). Further, Furr et al. (2001) found that the number of students who experience suicidal thoughts or attempt suicide might be significant, representing 9 and 1% respectively.

Other disorders and mental health issues academics may suffer include bipolar, personality, trauma-related, eating, and substance abuse disorders. Fear of stigmatization may lead academics to not disclose these conditions and thus not receive appropriate support. This is especially impactful for ECR who do not yet have a professional reputation and financial security to help them overcome the potential backlash of these conditions coming to light.

“If I Can Do It, Everyone Can”... or Not

Some readers may think of famous science communicators with disabilities or speech impairments, such as Prof. Stephen Hawking, and think “well, if they could do it, everyone can!” However, not only he had financial and emotional support, he also had personality traits that helped him overcome the emotional turmoil that meant living with such physical disabilities. While the saying may be well-intended, in reality it ignores the many external and personal factors that might impact both mental health and productivity (Hooker, 2020). Advocates of the “everyone” should engage in science communication efforts rarely consider these, sudden or persistent, factors. Persistent factors include not being a native to the country they live in (e.g., marked cultural differences); lack of financial or emotional support from family members and/or friends; emotionally or physically abusive family members, love partners,

⁸<https://animalecologyinfocus.com/2018/07/11/women-in-science-and-abuse-of-power/> (accessed October 16, 2020).

⁹Note: some people prefer to be called *autistic person* while others prefer *person with autism*

and/or friends; no or limited funding or income. Moreover, researchers can also suffer from chronic conditions that may alienate them, including stutter, echolalia and other speech disorders, malformations, skin diseases, and trauma due to sexual abuse during childhood.

Unexpected circumstances that can lead to significant changes in everyday life include natural disasters and global emergencies such as economic crises and pandemics (e.g., COVID-19 crisis), political developments of the country of residence (e.g., authoritarian regimes, coup d'état). Other unforeseen scenarios include accidents, sexual assault, sudden death of loved ones, and friends or family members suffering from developmental or terminal illnesses. These circumstances not only can lead to post-traumatic stress disorder or trigger a relapse due to past traumas, but also impair social communication skills, crucial for building a professional network.

These factors impact ECR especially, as they lack a support network that can help them climb the professional ladder. Hence, realizing ocean conservation goals calls for a collaborative environment to draw on individuals' strengths.

COLLABORATION AND WHY IT MATTERS

Two key components of ocean conservation are science communication and education, and thus it is increasingly expected that scientists engage in these activities on social media, and *via* blogs or other forums. Conservationists are offered science communication courses for non-experts, which typically last a few days to a week, and where attendees are trained in a different set of skills for this purpose. As discussed in previous sections, such basic training is likely not suitable for individuals with social communication difficulties, especially those with difficulties in understanding communication rules.

There is a large body of evidence showing that communication (both how the message is conveyed and interpreted) is a complex process affected by a myriad of factors. Two influential books on this topic are *Nudge: Improving Decisions About Health, Wealth, and Happiness* (Thaler and Sunstein, 2009) and *Thinking fast, and slow* (Kahneman, 2011). Broadly speaking, there is always a stimulus the audience has been exposed to (e.g., room color) that influences message perception (Kahneman, 2011). This is known as priming. And there is always a structure in the message, known as framing, influencing message perception. For example, doctors are more likely to recommend an operation if 90% of patients survive than if 10% die, despite the numbers being the same (Tversky and Kahneman, 1981). Learning how to frame and prime a message is crucial, yet not an easy task, as there are endless factors that cannot be controlled affecting communication with an audience, including education level, beliefs, confirmation bias, last song they listened to, when was the last time they ate, how spicy the last meal was, how long they have been awake for, previous experience with the topic, and a long etc. (Thaler and Sunstein, 2009; Kahneman, 2011).

It is understood that, in topics such as psychology, legislation, and statistics, expertise is not acquired *via* basic training. We argue the same holds true for science communication. This is especially important given many researchers have difficulties in social communication, such as those with ASD, which are attending university in higher numbers (MacLeod and Green, 2009) due to an increase in support and better understanding of the topic (Robertson and Ne'eman, 2008). In light of this, we argue that, to achieve the best possible results, we should engage in multidisciplinary collaborations also when it comes to communicating with non-expert audiences (e.g., policy makers), instead of seeking to train all scientists (Cooke et al., 2017). Multidisciplinary collaborations are the backbone of science (Esteban et al., 2014; Parsons et al., 2015; Scans III, 2017; Carlen et al., 2018).

While many scientists are skilled at science communication, they like it, and are effective at it, we argue that, given the factors discussed above, not all conservationists (especially ECR) should be expected to do it as some suggest (Cooke et al., 2017). Not everyone has communication skills or can benefit from a basic course, therefore they should not be forced to do so. It can be stressful or lead to anxiety and impact their professional career, especially if science communication efforts are to be rewarded, which effectively punishes those who cannot engage.

Further, attempting science communication with basic training can lead to unexpected consequences. For example, in 2014, a group of scientists reported that a methane compound could be used to target mitochondria in cancer cells (Le Trionnaire et al., 2014). Despite the efforts of the press office, journalists reported that smelling flatulence could cure cancer and recommended the practice¹⁰. While such an extreme case is not expected to happen in the context of ocean conservation, there is plenty of opportunities for scientific findings to be misinterpreted (López-Escardó et al., 2018)¹¹.

Established scientists and conservationists may have extensive experience in communication attempts *via* publications, grant applications, and other forums, giving them the opportunity to identify their strengths (e.g., conveying their ideas at scientific gatherings after substantial rehearsal) and weaknesses (e.g., improvising). ECR however, have not yet had these opportunities and exposing them to interactions with a non-expert audience when they have difficulties doing so can affect their career prospects (e.g., inappropriate engagement in social media) and how the public perceives science. "Any" message is not better than no message at all.

CONCLUSION

There is an increasing demand in the field of ocean conservation to implement changes to accommodate a pressing need

¹⁰<https://www.theguardian.com/science/brain-flapping/2014/jul/14/silent-not-deadly-how-farts-cure-diseases> (accessed November 6, 2020).

¹¹https://www.ibe.upf-csic.es/news/-/asset_publisher/PXTgqZXxlocA/content/id/213934032/maximized#.X6Wji9BKgmI (accessed November 6, 2020).

to communicate science to the general public, but there is also a need to accommodate new scientists and ocean conservationists who can make invaluable contributions to scientific advancements, regardless of their social and communications skills. While training in a range of fields (i.e., multidisciplinary training) is crucial to gain a general understanding of the many factors impacting ocean conservation, it is not, and should not be, an alternative to seeking expert input from other fields. Instead, we should foster collaboration with existing experts in all fields related to conservation, including experts in national and international legislation, as well as those related to behavioral change, such as psychology, evolutionary behavioral sciences, and science communication.

Throughout this manuscript we have highlighted many factors affecting conservationists, especially ECR, which are regularly ignored, and the ways they can contribute to developing mental health issues. We have shown that the expectation of engaging in extracurricular activities can have negative consequences for researchers, especially those with social communication difficulties. “Walk in my shoes” type of workshops for conservationists of all backgrounds could be crucial for raising awareness of the factors discussed in this manuscript. Simultaneously, ECR with communication difficulties could benefit from attending workshops early in their career to identify their strengths, weaknesses, and interests in relation to social communication, in a judgment-free

environment. Through collaborations, we can effectively draw on the more specialized skills of various people. Building an inclusive scientific community for ECR, therefore, calls for seeing diversity of skills, thoughts, and personality traits as its strength.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

MC conceived the idea. MC and LS-P drafted the manuscript and aided in finalizing it. Both authors contributed to the article and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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