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The cover image of Santa Monica Pier is by Omar Prestwich.

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FEATURE

REFLECTIONS ON NEGOTIATING THE SCIENCE-SOCIETY RELATIONSHIP TOGETHER

By The Tropical Rivers Lab [1]

Introduction & Process

At the Tropical Rivers Lab at Florida International University, rivers have convened us to think deeply about how to best understand them and apply that understanding towards their conservation and sustainable management. We explore different aspects of south Florida ecosystems, Amazonian riverscapes, and East African waters, with collaborations across

the tropics. When we decide “how” to best understand rivers, it is not just about the scientific questions we ask, but also about where those questions come from, how we relate to them, and ultimately, how these questions mediate our role with society. Yet how we negotiate this relationship is different based on our identities, individual experiences, and values. Traditionally,



Daniela Daniele took this picture to show that her research interests began with the canal that flows behind her apartment. This semester she’s defending her master’s thesis on the historical ecology of the Miami River. Image courtesy of Daniela Daniele.

institutional science has not prioritized conversations that delineate what scientists' place and community are and how to engage with them at an individual or collective level. As a lab that works in so many places with so many people, we want to be intentional about creating space to discuss what these values, identities, and relationships mean to us and how pursuing science and research plays a role in creating them.

For this piece in *Open Rivers*, several members of the Tropical Rivers Lab discussed our work, its relationship to communities beyond academia—including but not limited to those situated where the rivers we study flow—and how we negotiate our own identities and roles in our personal and professional lives. From these conversations together, we discerned commonalities and considerations that connect us as well as differences in the perspectives we bring to our work. We expected this conversation to result in a diversity of ideas: after all, our lab is big (over 20 members!) and diverse, encompassing undergraduate and master's students, Ph.D. students/candidates, post-doctoral scholars, collaborators, and faculty. To initiate the conversation, four of us created and edited a survey on Google Forms that touched on different aspects of science, personal identity, and science-society relationships (you can view and fill out this survey if you'd like! Take [the survey here](#)). Twelve anonymous members participated in the survey, and one of us collated the responses into groups of statements regarding three main themes: the roles that we take on, how our experiences and identities impact these roles, and our ideas about science-society relationships. We reviewed

these responses and discussed them in depth at a zoom meeting with 13 participants from our lab. We further convened one-on-one meetings to identify the main points of discussion and create an outline. Five of us took on the responsibility of fleshing out the above ideas in the outline, and twelve of us reviewed the draft before sending it to *Open Rivers*.

Through our survey, we identified over 50 discrete roles that at least one of us took on. These roles ranged from personal to professional, describing occupations, group membership, national, racial, ethnic, or gender identities, relational identities (family, friends, human and more-than-human community), sexualities, political leanings, interests, religion, geopolitical status, and ideologies. Many of these roles when in conjunction are more than the sum of their parts and are indicative of full lives beyond our role as scientists (see Figure 1). These full lives in turn have their own relationships with rivers that act as intertwining elements for our identities. Studying the rivers ends up being just one way we relate to them. So, even if and when we no longer study rivers, rivers can be powerful conveners.

In this conversation, we discerned that how and when we take on the role of a scientist is negotiated from our positionality and our context, and what that means for the lab as a whole also requires negotiation. We present these reflections here with the hope that other groups take on these conversations and that we can continue these conversations privately and publicly (and if you want to write some thoughts for people to see, [please click here!](#)).

Science-Society Relationship on an Individual Level

At an individual level, our work (science) impacts our individual participation in society, making the discussion of “work-life balance” a common topic. How can we better balance our personal and professional lives to feel fulfilled in both? While taking a break from the stress of work is

important and necessary, our personal identities are ever present in our work as scientists. These identities shape the foundations of our thoughts and impact our research (Rincy & Panchanatham 2014). These impacts may inform what questions we are interested in, how we interpret and answer



Figure 1. One of our lab's members, LuLu Lacy, is an artist. LuLu's relationships with non-humans and nature are important to both her art practice and her scientific endeavors. This painting, "dip my feet in the pond," explores the intimacy and secrets held between people and water. Image courtesy of LuLu Lacy.

those questions, and how we determine issues of importance. Being aware of our identities and how they impact our science is important to not only help avoid biases, but also to better understand our identities as scientists and the work we take on.

Not surprisingly, our individual identities have shaped the way we each conduct science as part of the Tropical Rivers Lab. Many lab members are drawn to research on riverine ecosystems that is action- and service-oriented, inclusive of diverse collaborators, and beneficial to local communities and underrepresented people. For instance, lab members have worked with local communities on issues pertaining to the impacts of dams in India and the Amazon Basin to advocate for better policy that represents local interests (for example, Jumani et al. 2017 in India, and [Romero 2017](#) for decision-making mismatches between communities and international development

organizations). Other lab members have studied the urban waterways of Miami, Florida, working collaboratively with community members to understand the meanings they ascribe to these waterways and to strive for management that is equitable and just. At a larger scale, we have worked to herald the importance of free-flowing rivers, recognition of tropical rivers as objects of conservation, and call for better understandings of human and social relationships with rivers (for example, Anderson et al. 2019).

For some lab members, the motivation to center our science around local needs comes from values adopted from our religions or cultures that emphasize charity, service, and justice, highlighting that rivers are part of the local and global community. Lab members recently participated in articulating a framework that centers how the rhythm of rivers is both created by and creates the rhythm of others' (both human and



Figure 2. Daniela Daniele took this picture to show that her research interests began with the canal that flows behind her apartment. This semester she's defending her master's thesis on the historical ecology of the Miami River. Image courtesy of Daniela Daniele.

non-human) lives. For example, the flood pulse of the Amazon influences celebration dates and sociality, and those celebration dates and sociality in turn mark the passage of time and anticipation that creates the relationship with and rhythm of the river (Harris, 1998). By centering rhythmicity, it is impossible to see how non-locals making decisions such as installing a dam and when to open and close flood gates could be just. Other lab members cite their belonging to historically excluded groups, such as people of color (POC), as a reason to study topics that allow them to “give back” to their own communities. Our identities have also shaped the physical systems and locations we are interested in. Several lab members are from, or have a strong connection to, the tropics and as a result are studying tropical ecosystems (see Figure 2). Other identities, such as being a parent, have impacted our lab members’ interest in scientific topics and how to ensure the world is a safe and inhabitable place for future generations. Overall, we concur that science is personal.

Not only do our identities shape the science we do, but the way in which we claim our role as a “scientist.” We collectively define a “scientist” as someone who participates in the “process” aspect of science (e.g., collecting data, posing hypotheses, etc.), and generally find ourselves in alignment with that definition. However, most

of us would rather claim more nuanced scientific identities that reflect the expertise we have intentionally honed, which can be narrow, broad, static, or dynamic. For example, one graduate student identifies as an “adaptation scientist” as this title encompasses concepts such as transdisciplinarity and usability, which are not as widely emphasized in scientific research. In this context, transdisciplinarity means that adaptation scientists must work with community members in addition to academics from other disciplines, and usability means that the research must respond to community members’ needs and be easily applied. Another group member identified as a “freshwater ecologist” early in their career. However, as their research interests broadened to encompass social science, boundary research, and stakeholder engagement, they now consider themselves a “freshwater scientist.” These definitions may seem like semantics to some; however, they help us as individuals to better understand the lens through which we conduct our work as well as the extent and transparency as to what we are not. For example, one member would call herself “interdisciplinary scientist with a background in ecology” to denote that she might be curious and know something about anthropology but is not trained in it. These definitions are part of our own personal and professional stories and can evolve as we explore new depths and horizons of science, society, and ourselves.

Science-Society Relationship as a Scientific Community

Adding to our exploration of personal dimensions above, we also discussed the societal obligations and political implications of being a scientist. These implications are presented from the perspective of a scientific community because the discussion extends to what the obligations are of scientists as a whole. Our conversation touched on important themes including basic versus applied science, the politicization of science, and the challenges and opportunities of community-based research. Reflecting the views of broader

society, we were not in complete agreement on these issues, and this discussion will attempt to present the points where our multiple perspectives diverged and the areas where our perspectives coalesced around shared beliefs.

As several of us mentioned in our survey responses and discussion, the role of scientist comes with respect and power. Therefore, it is not surprising that many of us felt that in claiming to be scientists, we assume certain obligations

toward society. One set of these obligations was centered around concerns for good scientific practice and philosophy, including not pushing data to attain desired results and a commitment to truth. Another obligation we discussed was a focus on applied science; that is, science focused on practical outcomes that can be directly used by stakeholders and decision-makers. For example, four lab members are part of a large interdisciplinary team that is developing actionable conservation targets for freshwater ecosystems

of the Amazon River Basin. While lab members highly support basic research, which is more focused on advancing scientific theory, many of us favor it being inspired by societal needs. We further agreed that both basic and applied science need to be communicated in a more accessible manner to the general public. Similarly, many of us feel an obligation to do research that benefits local communities or the most vulnerable sectors of society, and/or an obligation to address pressing global concerns, such as climate change,



Figure 3. Picture of Chicago Teachers Union (CTU) strike in 2019. Strikes are last-resort measures to force the decision-making structure to take seriously the demands of people who are not being included in the decision-making process. Unions in general have been one structural way to change how governance occurs by leveraging labor power. In the 2019 CTU strike, teachers demanded common-good changes in Chicago Public Schools, including more resources for bilingual education and houseless students. This is one example of actions that can influence decision-making without the requirement of specialized academic credentials (instead, valuing life experience and labor relations). Image courtesy of Natalia Piland.

in our research. Not everyone fully agreed with these ideas, with at least one of us stating that it is not necessarily a scientist's responsibility to engage in dialogue with the broader public about their work. Others suggested that while funding sources often come with attached obligations, such as scientific reports and peer-reviewed publications, or a focus on applied science, there may not be an overarching obligation to connect research with stakeholders and ensure that research is usable and sustainable in addressing long-term and holistic needs of local communities and decision-makers. Ultimately, we felt that the diversity in obligations could impact the types of collaborations and science on which our lab embarks.

These obligations are fundamentally rooted in scientists' role as an authority who guides society (Porter 2020). Historically, this position of scientific authority has been dominated by men with access to power (in the U.S., for example, white men) and as such, who the scientific community includes as scientists has political implications. For those of us who do not fall in that category, becoming a scientist through education and credentials can be a path to standing and respect that might be otherwise unfairly withheld. Group members described attaining a Ph.D. as a way to make people take them seriously and to force others to respect their knowledge and experiences. These strategies are not without their pitfalls, however. One group member described struggles to make themselves "palatable" within the world of academia by hiding parts of their identity, such as their sexual orientation, gender identity, religion, and/or spirituality to make others more comfortable and thus make sure they are listened to. Another group member said that attaining respect through credentials is a means of survival for women (including trans women), nonbinary folks and trans men, and people of color broadly in professional fields and societies that have historically disregarded their knowledge and experience— and often still do. However, the group member recognized that the emphasis

placed on attaining academic credentials might be misdirected, and that the focus should instead be on dismantling or structurally changing our governance system so that academic credentials are not the only way to attain decision-making or decision-influencing power (see Figure 3). Do you attempt to succeed in a system not made for you, or do you fight to change the system? Many of us are attempting to do both.

Meanwhile, for those of us working in partnership with Indigenous communities or other vulnerable communities in the Global South, claiming the role of scientist for community partners can be a way to honor their contributions to research, shift where decision-making takes place, and align our research projects with the interests of communities most impacted by our work. Owning the scientist role for community partners could come in the form of using community-based or co-research designs (Kainer et al. 2009). Another form would be to give authorship credits to community members participating in research (Pinedo 2021), not only because they participated in the research but because as knowledge holders, they are authors of the research. Both of these strategies allow us to honor community members who may not be professional scientists or trained in Western science for their contributions, and to engage with other ways of knowing the world in complement to Western science. Several group members mentioned explicit support for such strategies, with one describing them as "giving people rights and participation they deserve" and another explaining their community-based scientific ideal as follows:

Scientific studies should be initiated by communities, conducted in constant communication/interaction with communities, and monitored/sustained (as appropriate) by communities long after the core scientific work is finished, however with technical assistance from scientists as needed.

In our discussions, we used the phrase "opening up the role of scientist" to describe this process

of allowing “non-credentialed” community partners greater recognition and responsibility in research projects. As mentioned above, many of us saw benefits in “opening up” science, but others brought up potential risks or dangerous side-effects of such an approach. Benefits included improvements in the relevance and validity of science through the inclusion of other knowledge systems (local, traditional, Indigenous, etc.) in research design, interpretation, and dissemination. These benefits may be especially pronounced if collaboration occurs during the initial stages of research design (Kainer et al. 2009). Additionally, because the word ‘scientist’ carries power and responsibility, it also offers the opportunity for community members to be empowered and feel greater responsibility for their role in the research endeavors that they choose to be a part of. This empowerment and sense of greater responsibility of community members can offer benefits to research projects, the community, and the individual.

Another set of benefits of “opening up” ideas of what constitutes science relates to justice and equity. Given global and sub-national inequities in access to scientific training (Pinedo 2021), “opening up” the role of scientist creates greater fairness in filling an important and powerful societal role. In addition, opening up science could provide a means of stopping the perpetuation of historical injustices. There is a long tradition among Global North scientists of recording and publishing Indigenous knowledge under the guise of “new discoveries” with no credit given to knowledge holders (Pinedo 2021). Thus, Indigenous knowledge holders have been made invisible in scientific practice. Opening up ideas of who can be a scientist and what knowledge constitutes science through measures such as giving authorship to community participants may provide us with a way to discontinue exploitative, unjust practices.

Living by these values and objectives comes with its challenges. Two challenges we discussed were

about how doing this well requires constant reflection to make sure that knowledge of others isn’t co-opted, and how making science more accessible might make it more accessible to people with poor intentions. These potential dangers had more to do with societal-level concerns around the politicization of science; by stretching what counts as “science,” do we risk providing platforms for bad science? Do we mischaracterize and misuse other types of knowledge? How do we prevent gatekeeping, yet maintain rigorous scientific principles? For the first challenge, there are many examples where Indigenous or non-Western science has inspired theory in ecology, and may represent “knowledge assimilation,” where this Indigenous or non-Western science is incorporated without citation, thus violating “knowledge sovereignty” (Norgaard 2014; Todd 2016). For example, many permaculture and sustainable agriculture techniques draw from centuries of Indigenous experimentation without authorial or material attribution. In effect, “opening up science” may imply “knowledge assimilation” where dominant science co-opts other knowledge systems, and thus any “opening up” requires intercultural and transdisciplinary dialogue and critique, and better relations (Liboiron 2021). For the second challenge, the COVID-19 pandemic has demonstrated how politicians can make public health matters into dangerous situations that benefit them by misapplying and or misunderstanding science. A Brazilian group member pointed to President Bolsonaro’s support of controversial treatments as a misuse of science to make the pandemic seem like a smaller issue and thus encouraging people to continue working and consuming (Diaz 2021). The idea that we can all do our own research, while an idea that most of us agree with, can be dangerous if it is not clear that all science, Western or not, has its own rigor (Petersen 2021).

There are also practical challenges. Co-research approaches require reflection and many scientists do not prioritize this or do not feel they have been trained to take on these (often self-critical)

reflections. Furthermore, the current academic system does not consistently value trans- and inter-disciplinary approaches in many fields (in the form of employment opportunities, advancement, or resources). The extra knowledge, time, and long-term relationship building required provides a powerful disincentive, particularly in the academic sector where there is a lot of turnover. In terms of societal concerns with “opening up the role of scientist,” one group member likened

the problem to that of contemporary journalism, which has been made more democratic by technological advancements but with attendant new opportunities for misinformation and political influence. Other group members pointed out that misinformation is not a coincidence, and that the manipulation of both media and science is a political endeavor that could be counteracted by structural change that gives decision-making power to more people.

Where does that leave us? Flowing in our Future

The conversation will continue in our lab meetings and in one-on-one conversations. A next step is the creation of a lab book that outlines our values and principles, as well as the ways of conducting research to which the Tropical Rivers Lab aspires. A big inspiration in this process has been the [Civic Laboratory for Environmental Action Research \(CLEAR\) lab](#), and we highly recommend their materials for inspiration on how to go about identifying and working based on collective values. Additionally, we hope to connect with other groups of researchers, practitioners, and people to better situate the research that we, as a lab, take on.

Achieving the community-based scientific ideal mentioned above is challenging, especially within the time frame of a research degree (master’s or Ph.D.), or a short-term postdoctoral position. It requires establishing trust and deep relationship building, and it requires communities that are willing and have the capacity to engage in this iterative process. It is important to think about these things as a lab group so that these groups and leaders/collaborators can take responsibility for long-term relationships that are initiated and/or grown by individuals completing short-term research projects (see Liboiron 2021 for more discussion about how to sustain relationships in research). In our experience, many of us take

on research in places where we already have community connections, something that brings us back to our initial point: who we are informs our scientific practice. Academia must also wrangle with the fact that there are many barriers in research positions that make it impossible to reach this ideal, from the many hats that academic researchers are expected to wear to the poor research resources to the time frames expected. One important thing to think about as we move forward is how to handle any disagreements. We thank *Open Rivers* for giving us the opportunity to think through our perspectives on science and society relationships from our individual stances via the written form—this opportunity has been one way for us to listen to each other and see how context matters. Finding different media through which to communicate (written, one-on-one and group meetings, and surveys) with different levels of anonymity allows for topics to be introduced and discussed respectfully and with responsibility to each other as lab members. Ultimately, it’s a balance: we do not have to agree on everything, but we have to be able to listen to each other, think about where we are each coming from, and clearly define the objective of the research in question. For the Tropical Rivers Lab, this fluidity helps us change according to our interests and opportunities as scientists, and also according to our commitments to greater society.

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Footnote

[1] The Tropical Rivers Lab is housed at Florida International University and can be found online at www.tropicalriverslab.net This paper was facilitated by Dr. Natalia C. Piland. Writing was carried out by (in alphabetical order by first name): Dr. Claire Beveridge, Lauren Emer, Mason Bradbury, and Tania Romero. The piece was based on anonymous surveys and a Zoom discussion attended by Brenna Kays, Dr. Elizabeth P. Anderson, Dr. Erin Abernethy, LuLu Lacy, Maria Pulido, Nadia Seeteram, Suman Jumani, and Dr. Thiago Couto, in addition to those already mentioned. The piece was then reviewed by all those mentioned, as well as Daniela Daniele and Juan Sebastian Lozano.

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About the Author

The Tropical Rivers Lab is based at Florida International University. We conduct basic and applied research to support conservation and sustainable management of tropical rivers. The lab is led by our principal investigator, Dr. Elizabeth Anderson, and has an average of 12–15 members, ranging in academic levels from undergraduates to collaborating professors. We aim to understand freshwater ecosystems as social-ecological systems, and how these systems are being transformed by river alterations, climate change, human population growth, and introduced species, among others. We are committed to working with multidisciplinary teams and diverse communities to generate information that supports new conservation frontiers for freshwaters. Geographically, the lab's work focuses on south Florida ecosystems, Amazon riverscapes, and East African waters. You can find more information at tropicalriverslab.net