S1 E10 Floria Mora-Kepfer Uy

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SPEAKERS
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Floria Mora-Kepfer Uy 00:00

I think we're in a very exciting time where we're starting to link the ultimate and proximate aspects of animal behavior. Try to really understand this relationship between evolution and mechanisms. And this is a very exciting time to do that with all the new cutting edge tools that we have.

Amy Strauss 00:19

Hello, and welcome to the final episode of season one of the Animal Behavior Podcast. I'm Amy Strauss. In today's episode, I speak with Dr. Floria Mora-Kepfer Uy, a Research Assistant Professor and Assistant Professor of Instruction in the Department of Biology at the University of Rochester. Her research addresses the evolution of sociality and animals, exploring both ultimate and proximate explanations for group dynamics. She works primarily with social wasps to investigate the relationship between social interactions, behavioral cues, environmental context and brain architecture in shaping group dynamics. She's particularly interested in tropical ecology and evolution and has multiple projects based in the tropics. In this episode, we talked about the selection pressures that favor the evolution of sociality, how brain architecture varies among individuals with different social roles, and brood parasitism in a social insect. Then, after the break, we talk about tropical fieldwork, mentoring and diversity in STEM. We close by hearing her excitement about the future of animal behavior. I hope you enjoy. Let us know what you think at animalbehaviorpod@gmail.com While this is our last episode of season one. We're hard at work preparing for season two coming in early 2022. We're expanding our team and we're really excited about the growth of the podcast. Thank you to all of our loyal fans and new listeners. Keep your eyes peeled for a listener survey that we'll be launching soon to learn about our audience and how we can better support the animal behavior community through our podcasts. My guest today is Dr. Floria Mora-Kepfer Uy, a Research Assistant Professor and Assistant Professor of Instruction in the Department of Biology at the University of Rochester. She is one of two principal investigators leading the tropical biology research group at the University of Rochester nicknamed the Trop Bio Lab. Floria's research investigates the ecology and evolution of sociality and animals looking primarily at insect systems. She runs projects, both locally and internationally, with a special focus on the tropics, where remarkable species diversity inspires big questions in ecology and evolution, Floria, welcome to the Animal Behavior Podcast. Thanks for being here.

Floria Mora-Kepfer Uy 02:43

Thanks for having me.

Amy Strauss 02:45

The broad theme of your research program is animal sociality, how animals live together in groups navigating the complexities of conflict and cooperation between individuals within a society. Can you start by telling us first how you define animal societies, and then characterizing the variation in sociality that we see in nature.

Floria Mora-Kepfer Uy 03:05

Animal societies can broadly be defined as a group of individuals that interact, and it could be in permanent groups, or it could be context dependent, or it could be seasonality. So there are many different ways that groups can form according to the specific context that individuals and the specific selective pressures that they are exposed to. A society can indeed be a group of individuals in which being part of a group is more beneficial than being on its own. But at the same time, it doesn't necessarily have to be permanent, it could be flexible.

Amy Strauss 03:46

Would you consider species are either social or not social, or because of this sort of flexibility and flux? Would you not necessarily divide up animals that way?

Floria Mora-Kepfer Uy 03:55

It seems that most individuals are social and have social interactions in some form. Or another, it could be for mating purposes, which individuals that sexually reproduce actually have these interactions. But perhaps they spent most of their life other than that, raising their offspring or being alone other than the time when they're interacting to mate. And there could also be flexible societies or societies that form a specific context. But when individuals do well on their own, or in smaller groups that can change too.

Amy Strauss 04:30

Your work is grounded in a solid evolutionary framework. In thinking about social systems, societies and groups, you're really interested in the fitness costs and benefits affecting individuals, and how that links into the bigger group dynamics. So with this in mind, I'm going to ask a big question that I know you think about a lot. How does animal sociality evolve or what selective pressures seem to favor group living?

Floria Mora-Kepfer Uy 04:54

So I think there are several common patterns in nature in which societies can evolve. One of them is when there are higher benefits than cost of forming groups, for example, defense against predators increases your chances of fitness of securing food resources. But of course, sometimes fitness efforts can also be diluted within a group. Another way that sociality has evolved is if individuals form groups of relatives that can increase our own fitness. So the chance of passing on our own genes, but also increase our fitness indirectly, and the chance that your relatives will also reproduce. So there is a benefit to ourselves, if we aid our relatives, we even have groups of non relatives in some cases that cooperate because the benefits are really high. Certain species are fascinating, because group formation will depend on lot on the environment, it could be seasonal constraints, and it could be also competition for resources and density of individuals too.

Amy Strauss 06:05

So while you work within the solid evolutionary framework that we just talked about, you also focus at the proximate level, thinking a lot about the role of the brain and social interactions within these systems. Can you zoom in now and talk about how the brain of social animals is specialized to enable group living? This is especially interesting to think about in the context of the flexible societies you just mentioned.

Floria Mora-Kepfer Uy 06:26

So I am very lucky to work in flexible societies, specifically, of wasps so most of the research I'm more familiar with is in social insects, and specifically Hymenoptera. And these flexible societies allow us to be able to compare when individuals are forming large groups and how they're going to allocate neural tissue, which is energetically costly, according to, to their needs, and to be able to communicate and interact with members of their colony. And these groups have different tasks to so within a colony, there's individuals that will be reproductively dominant, and they will spend more time on the nest and there's other individuals that will have other tasks which are riskier, they tend to be subordinate and have to forage, which is a very different set of skills cognitively to be able to, for example, navigate and recognize landmarks and be able to find prey or, or material to control construct their nest with, rather than being a reproductively dominant individual that spends most of the time on the nest with the offspring. So what some of the research has found is that in these, even within these social individuals who are interacting, there seems to be more energy allocation to tasks such as navigation, and visual recognition of landmarks in individuals that forage versus reproductively dominant individuals who may be communicating with incoming foragers. So even within a species, we could see how the brain will invest precisely in certain regions that will be up there or more necessary for specific individuals. And interestingly, in these societies, we also see that individuals have the choice to start out as a solitary foundry. So they start to build a nest and to initiate a colony on their own with their offspring, or as a group of founders. And there has also been research that shows that brain allocation in the solitary founders is different from the social ones.

Amy Strauss 08:42

Are these roles determined through developmental cues, or genetically? One that will grow into a forger, for example, how is that determined?

Floria Mora-Kepfer Uy 08:49

Well, there are other social insects, for example, bees, and while some species of bees that are social, not all, and ants, which all ants are social, that they actually have, nutrition is very important to determine what their role will be, in the case of these flexible societies of wasps. Indeed, nutrition. Nutrition will have a role of, in the individual but also it is a matter of the dominance hierarchies. So in this case, certain individuals that are stronger, they tend to be more aggressive, and they actually can hinder the development of the ovaries and actually exert dominance over other individuals that will become subordinate. But interestingly, that can change throughout the lifetime of a colony so some individuals can actually usurp and take over a dominant roles and some may be able to descend into dominance. So one of the really fantastic things that we can study is actually how does this neural tissue allocate according to the experiences the individual has had in the past, too. And recent research by colleagues has also shown the individuals, for example, in ants that fight for dominance. Winning ants that are Queens actually have their their brains actually shrank, and the ones that actually become subordinate, their brains have to increase because they have to start foraging. And they need to be able to recognize landmarks and such. So there is more plasticity that when we had thought in the past, which is really exciting.

Amy Strauss 10:37

That is exciting. Your research clearly spans a range of biological areas, including ecology, physiology, neurobiology, genomics, and you combine fieldwork and lab work, how do you understand behavior to be a foundational idea or central connection in your work?

Floria Mora-Kepfer Uy 10:52

If we think about commonality among pretty much any animal in the planet is that it has evolved specific behaviors towards its ultimate survival, its ultimate fitness and to be able to do well in its environment given specific circumstances. So behavior really is key to understanding evolution. And when we start to understand the why questions, the big picture questions, why behaviors happen, we can't help but also start to think how these behaviors happen. And in the past, it seems that some of these questions were answered separately. And I think we're in a very exciting time where we're starting to link the ultimate and proximate aspects of animal behavior, try to really understand this relationship between evolution and mechanisms. And this is a very exciting time to do that with all the new cutting edge tools that we have. And it seems that researchers interests are starting to overlap more, and the dabbling between these different aspects of the big picture of behavior, and how such a wide range of amazing and very specialized behaviors have evolved throughout the animal kingdom.

Amy Strauss 12:21

You've said that your trajectory and animal behavior was defined by your dissertation research, can you briefly talk about what your dissertation research was? And how that led you on your path and animal behavior?

Floria Mora-Kepfer Uy 12:32

It seems that I've always been interested in certain questions. And actually, I think one of the defining moments for me was as an undergraduate researcher, where I with the great findings of Mary Jane West-Eberhard, I started to actually observe loss colonies for a long time and became fascinated by their dominance hierarchies, and how these could change throughout time and what the effects were on individuals physiologically, behaviorally. And now more recently, we've been able to talk about brain too. And I think that a lot of this information and these readings sort of standing on the shoulders of giants reading a lot for my dissertation, it really solidified my strong interests for understanding why certain animals, there is an advantage to flexibility in societies for certain individuals or, in other cases, this can change throughout time. And hierarchies can really shift depending on many other different factors that they're exposed to. So it's a wonderful way of thinking of joining things, such as cues from the environment with social interactions, to be able to think about the physiological results of a lot of these things for individuals ascent to dominance, so they have a higher chance of developing their ovaries and being able to reproduce. So they have, they're going to have direct fitness versus individuals that through becoming subordinate and being able to be dominated physically through aggression by other individuals actually regress their ovaries. And this is something that can change if they have a chance to lay an egg later on in life, they will actually develop their ovaries again. So for me, my dissertation gave me the opportunity to really think about these questions and be able to develop ways to test or to start to get at how these different things that we had just talked about when we want to link some of the proximate and ultimate parts of behavior, how these were correlated with each other.

Amy Strauss 14:45

You're in a great system for tackling lots of these questions at the interface of evolution and behavior. Along these lines, I want to talk about one of your papers titled "Context dependent acceptance of non nest mates and a primitively eusocial insect". So you're talking about how new individuals can either welcomed in or rejected from existing colonies.

Floria Mora-Kepfer Uy 15:04

So one of the things I was very interested in when I was thinking about questions for my dissertation is, well, if an individual emerges as an adult on its nest, if there are a lot of other individuals already, and there is already a dominance hierarchy, their chances of direct fitness, and having a higher rank in the hierarchy are very low. So they have two options, they stay in their nano colony, or they can disperse. When they can disperse and these wasps systems, they can do multiple things, they could start out as a single foundress, where if the individual may obtain all direct fitness, but there are a lot of other

factors against you, you have to build the nest on your own, you have to defend it against predators, there is a lower chance of survival, you can also form a group. But if you form a group, there may not be a chance for your direct fitness. So you may choose to form groups with your relatives, and enhance the chances of indirect fitness. Another option is to join another group that's already been formed. Now, we would expect that since Hymenoptera, there are relatives are very closely related due to their haplodiploid system that they would choose to group with their relatives. But we have found now when we started to be able to actually measure relatedness by new technology, that there are individuals within groups that are not related to the rest of the group. And it turns out that some of the newer work that we have, is showing that some of these individuals, there's two ways to think about this. One thing is what benefit is there to the individuals that are already colony residents to accept someone new into their group. And this could be at a moment where very early on they're establishing a nest and the extra help is very valuable. And there's less chances that this individual may try to destroy the eggs and try to take over reproductive, of reproductive control of the colony. So this is a way where perhaps this help is needed at the time, and individuals may be able to accept it. And for an individual that is approaching there is a cost to keep searching where to join, which could it could get rejected. And also if you join a small group, there's a higher chance you may be able to ascend within the hierarchy that perhaps if you stay in your natal nest where you are a low ranked individual out of a very large established group already.

Amy Strauss 17:41

So to join a group of non kin is sort of a gamble on being able to rise in the ranks and eventually have direct fitness benefits in terms of rising in the ranks. How does that happen?

Floria Mora-Kepfer Uy 17:51

The highest chance of being able to shift and achieve a higher rank in the hierarchies is early on. Especially we, we've had a wealth of knowledge from established colonies of but one of the things I was very interested in is that we had less information of colony formation, which in nature is relatively hard to actually nail down in the wild when these colonies are being established. But I was very lucky that during my PhD, I found a great location and I was able to actually study individuals, they start to form small groups even before building so for a day or two, there's groups of individuals that are very close to each other. So individuals come and go. And very quickly, they start to build the first cell, and someone immediately lays the first egg. So there is already reproductive dominance. And it can be coupled with with physical dominance with aggression, although in the species that I work with is a little bit more subtle. But in paper wasps, we know that it's a combination of reproductive and behavioral, so dominance, so this aggression, so during this period of establishment, even though usually one individual becomes reproductively dominant, that we still see that individuals come and go, some of the individuals within the group and the number of individuals in a group changes. This is a good moment for changes to actually happen. But we have also we also know that, you know, nature is unpredictable. Sometimes when a group of founders is, is starting out a nest, most individuals will go out and forage. And in some cases, even the one that's reproductively dominant may have to do some tasks outside of the nest. If an individual dies or somebody stronger comes along, in this case larger they could take over reproductive dominance, and they actually destroy the brood of the previous individual and lay

their own eggs and assert this behavioral dominance, which will regress the ovaries of the other individuals, at least temporarily, until perhaps someone stronger can come along. So this early sort of calling establishment period, it's very dynamic. And it can be fragile in some ways. And we wanted to do this by actually trying to simulate what joiners, this potential joining. And what we saw is that when individuals tried to join, but they are not perceived as a threat, they're accepted more often.

Amy Strauss 20:38

How are these negotiations taking place? What kinds of communication do wasps use?

Floria Mora-Kepfer Uy 20:44

Like I mentioned, aggression is a big one where there is a physical, there's biting there is actually mounting individuals mount each other to assert dominance. But of course, there's other subtle forms and tonation to communicate through odor that is very important for social wasps. There are also wasps that actually have a very developed visual system, and they actually can recognize individuals within a group. And of course, we have subtle forms like prophylaxis. So requesting food from nest mates and such.

Amy Strauss 21:20

Within your work on social wasps, you're currently looking at climatic variation in local conditions, and how populations can potentially adapt to these changing climates. Can you tell me a little bit about that study?

Floria Mora-Kepfer Uy 21:31

I think one of the things that interests me the most when I was starting out as a scientist, and also currently is that there are very different selective pressures in the tropics, where you can have a dry season and a wet season compared to temperate zones. And we can have very strong factors such as predation, which has been shown in the tropics to consistently be one of the factors that may promote group living. But one of the things that I started to get really interested in is that there are some key species that are widely distributed. So how does one species, how can it survive and adapt to different environments, and the wasp I study for my population is subtropical, but its distribution is larger than some other species. And it can deal with winters, some of the populations. And I got very interested in it, how can the species actually just do well in such different environments. And more recently, we've had the chance to explore this. And we have found very interesting links in behavior from our research and also wonderful research by colleagues. It seems like the salt subtropical populations, group formation has to do with things like I, I've mentioned, predation, for example. And it has to do with availability of nesting sites, it also has to do with the dynamics of different individuals interacting with each other. But in this species, when it's in places with more marked seasonality. In the spring, they tend to like to start nests on their own to have a chance at direct fitness. And later on in the season, they become more tolerant of forming groups. And the other big question is, so we've seen these changes in behavior where consistently in the tropics, and then the subtropics species are perhaps

exposed more to these decisions without the constraints of of the strong seasons. But in these other regions, the other thing we are very excited to answer is how can the species overwinter? How are they going through diet loss?

Amy Strauss 23:56

Wow, that's really interesting. Do you know yet, have you tested this already?

Floria Mora-Kepfer Uy 24:00

Well, we have tidbits of information that we're very excited about. And there there seems to be some I don't want to get ahead of myself that this is new research. But it seems that we're getting to the point where we're starting to see changes locally in different environments, we we're starting to see indices of perhaps selection towards a different genes that may allow for example, individuals to regulate their circum annual rhythm as seasons progress and be able to deal with the cold versus the subtropical populations, which in a way are a little bit more spoiled because they are not constrained by things like temperature. So we are starting to try to understand the physiology and hopefully also have some ideas of genomically what has happened for these individuals to be able to... the same species be able to adapt to widely different climates and climate studies that way provide us with the unique opportunity to try to integrate behavior, physiology, genomics. So we're pretty excited about that.

Amy Strauss 25:12

Is there a reproductive isolation between those temperate populations that deal with some of these climatic factors and those populations that don't have to deal with them.

Floria Mora-Kepfer Uy 25:20

So at first, we thought, well, perhaps there is a strong pattern isolation by distance, or there is gene flow with nearby populations. But interestingly, one of the things we have found is that the subtropical populations seem to be more restricted in gene flow, we're not exactly sure. Now, we are studying parts. In this case, this was done. This has been studied in South Florida, where we have habitat fragmentation. And we have other things such as hurricanes and other specific circumstances that these individuals deal with. But as... as you start to transition to the temperate zone, we start to see more gene flow. And there seems to be an interesting pattern, right where this transition zone between subtropical and temperate begins, at least we have some idea that there is a shift. There's some population structure there and that shift, so we want to tie it, of course, now with the behavior and see along this transition zone, we start to see these changes also in their behavioral strategies with group formation.

Amy Strauss 26:31

How do you think the temperate populations are dealing with overwintering?

Floria Mora-Kepfer Uy 26:34

Since these wasps do sting, we usually try to find creative ways to be able to mark them, we mark them individually to be able to, you know, look at their behavior. And one of the ways we do it is to actually cool them off in a fridge. And when they are, you know, they stop moving, you quickly mark them, and then they recover very quickly. This was before I was interested in changes in temperature and the species. And I was working with wasps in Miami and Miami wasps didn't do very well on the fridge, I had a couple that died on me because I left them in the fridge for too long. And this in the long term, this kind of mistake made me realize, well, it seems like they don't do well in the cold. And it makes sense because they're not dealing with this. And when I started to work with temperate the temperate zone, once we started to notice how clearly it makes sense that they would be adapted. So to make up long story short, we're starting to find candidate genes that may be associated to, for example, not freezing to be able to deal with regulation of fat in the body to be able to deal with overwintering and diapause. So we're starting to get at this and we're starting to run physiology tests to be able to compare how for example, that CT min and max of individuals does change according to their location is grouping providing them an advantage to be able to deal with the winter or not, where that's something we want to explore. Another interesting question that could be answered by some experimental manipulations could be if individuals that group to overwinter are building nests later on, when spring begins, if they are grouping selectively with these individuals, or, of course, we know they tend to group more with relatives. But is there something about overwintering that also influences group formation later on for reproductive purposes?

Amy Strauss 28:43

Can you tell us just a little something about your work with brood parasitism in these social insects?

Floria Mora-Kepfer Uy 28:49

One of the costs of being social is that you may attract individuals that might want to exploit you. So one of the questions we're interested in now is, so how do certain individuals such as brood parasites, so these are individuals that may be a closely related species that has lost sociality, they come from a social ancestor, but they are not social anymore, these brood parasites, which are also known, and for example, in cuckoo birds, and cowbirds. These are also found in other systems. Now they have lost sociality, where they don't even build an essence they exploit other individuals to raise their offspring. And this is a combination of a limited behavioral repertoire, which is more important into finding a host and being able to deceive a host and for the host to counteract by evolving ways to recognize that. So we're very interested in how this relationship has co evolved. And this is a widely studied pattern and it occurs in many different systems in nature. Interestingly, in these systems, we're starting to find relationships with neural correlates. So we have found, for example, that social parasites are investing more in vision which has to do with migration and locating their prey and the social hosts have evolved olfaction and ancestry processing to be able to detect so these closely related species, in this case in the wasp, where they're even from the same genus, these individuals seem to be allocating neural tissue according to their sensory needs.

Amy Strauss 30:30

My knowledge of brood parasites is largely from the bird literature. And my understanding is that the parasite will come lay the egg while the host is often nest and in social grouping like the wasps is there a time when the nest is not being defended?

Floria Mora-Kepfer Uy 30:43

Well, this is actually fascinating and, and creepy. I would say at the same time. One of these species that we're particularly looking at with wonderful collaborators. What they actually do is that the social parasite comes and finds host nests and actually battles with the dominant individual and kills it. So kills the host queen, and immediately acquires the odor of the colony, destroys the really young broods, such as eggs, and lay its own eggs and the workers start to attend to those eggs. But the story gets more complicated because some of our colleagues have found that eventually, the host workers do catch up that they're rearing the wrong brood. So the way that the social parasite counteracts is to actually have his offspring develop very quickly.

Amy Strauss 31:37

What a rich system for asking so many cool questions! Thanks, Floria. Let's pause now for a quick break. When we come back, we'll shift gears a bit away from your particular research program and talk about some broader topics in the field of animal behavior. First, here's a two minute takeaway.

Bishwarup Paul 31:58

I am Bishwarup Paul a research associate in the Indian Institute of Science Education and Research Kolkata, working with Professor Sumana Annagiri. We studied the behavioral ecology of a tropical ant species, Diacamma indicum. A few years back, we found the presence of a fascinating behavior in this species: theft of brood. You may ask, why is this important? The thing is, brood theft has only been seen in highly eusocial species belonging to temperate regions, and no records were present in the tropics, and that too, in a primitively eusocial, and even more fascinating, most of the records of brood theft are interspecific, where the colonies either eat the stolen brood, or force the resulting adults to work in the thief column. But in our case, theft is intraspecific and the stolen brood becomes part of the thief colony. Though theft in this species is opportunistic, and we believe specialized thieves are not present. The loss can be staggering for the victims. Thieves prefer to steal pupa, and a quarter of a colonies pool of pupa can be stolen, making it a very rewarding affair for the thieves. Colonies are most prone to theft when they're under the emergency of immigrating to a new nest. Victims can defend themselves well, by showing aggression to the thieves, but the interactions are never fatal. Nonetheless, thieves use tricks to achieve success by avoiding aggression. They remain stealthy, and increase their speed manifold. The presence of such unique behavior asserts the need for more studies on tropical lands.

Amy Strauss 33:53

And we're back I'd like to talk now about something that many who work on animal behavior have experience with and that's performing research out in the field.

Floria Mora-Kepfer Uy 34:01

Growing up in the tropics, clearly, I am influenced by what I observed when I was younger, and my passion for social insects. So I have been lucky enough to work in Costa Rica, in the sub tropics, in South Florida. And recently, I've explored... started to explore temperate zones more and also, we are very lucky that we do field research in the Galapagos Islands and in the Solomon Islands. There are just many wonderful social insects and ideas to explore in the tropics.

Amy Strauss 34:35

Building on that, can you talk about how your Costa Rican roots inform your science?

Floria Mora-Kepfer Uy 34:40

I'm very lucky because I grew up influenced by naturalists and by naturalist I mean, my grandparents on my paternal side were coffee pickers, and they were always exposed to nature and they picked up these amazing patterns and had an eye for plants and animals, my grandmother was really into medicinal herbs. And I grew up learning a lot from them anecdotally. And also, they would tell me about the way that, for example, the Central Valley in Costa Rica, the plant and animal diversity was when they were growing up. So I think a lot of that influenced my interests. And the other thing is that I was very lucky to be at the University of Costa Rica and the biology program, there is just fantastic. It's the perfect natural experiment, we have wonderful biodiversity. And I found some mentors. And I was since I was little, I was interested in what we call bugs, right invertebrates, overall, and I just found the right entomology mentors. And that just that was very critical for my passion. And for my interest to be able to find a group of very engaged Costa Rican peers that were, we were we would go on expeditions to observe and collect insects. And it just happened very naturally, that we had just access to this amazing biodiversity, the right mentors, and just a wonderful group of people that we were all very interested about insects.

Amy Strauss 36:18

You mentioned how important it was for you to have strong mentors, and I know you prioritize being that strong mentor to young scientists. And part of your commitment to mentoring is rooted in the idea that strong mentoring is key to solving the problem of under representation of minorities in science. How do you see mentoring as a key part of addressing this issue?

Floria Mora-Kepfer Uy 36:37

You know, I've thought about this question a lot, because strong mentoring can come in many different flavors. And I think that is the beauty of it. Strong mentoring could be that you find a mentor that can help you really unlock what you're interested in. In my case, I was mentored by actually two American professors that decided to live in Costa Rica, and they love Costa Rica so much that they were fully bilingual. All my classes were in Spanish. But they also have strong conceptual backgrounds in evolution and taxonomy, Dr. Bill Eberhard and Paul Hanson, and they even though perhaps we were from different backgrounds, we did share the love for insects. So strong mentoring, in this case, and just this excitement for learning about insects and asking questions and trying to answer them, was very enriching for me. So that is one way where you find a mentor who shares this passion and can help you channel it. Another way. And this is something that I have experienced is that I taught at an institution where there were a lot of Latino students in the past. And in this institution, it seems that I was able to find students that I had, you know, we could really relate to each other naturally, we have similar backgrounds. But now that I've moved to the University of Rochester, interestingly, I've had a couple of students come up to me and tell me "wow, this is the first time I've had a Latina professor, this is the first time I've had a woman of color as a professor". And I can relate to that. And it has made me feel, first of all, very happy and very privileged to be able to experience and interact with the students. But at the same time, the power of just seeing someone that you can relate to from similar backgrounds. And I think that hits a very important part of diversity. If organically, scientists are more diverse, it's very welcoming, and very inclusive. So it's these small steps to work towards a more diverse community, that eventually these efforts add up and it becomes very natural. And I think a really good example of that is the Animal Behavior Society that has been very, very organically diverse for decades, at this point, where people sometimes don't even think about it anymore, because it's the common thing we all love animal behavior, all from different backgrounds. And it's a wonderful sort of melting pot of interests and backgrounds. Finding a mentor that you can relate to, in different ways can, even at this stage in my career. I am very grateful for many mentors in the same way for students and sometimes by just the way you look that they can relate to you and sometimes they share your interests. I think there's just many different ways of strong mentoring.

Amy Strauss 39:52

You clearly make certain to put time and effort into being that for other people. Mentoring takes time, and we're not necessarily explicitly trained in it when we go into the field of science. So I think there's many people who maybe struggle with how to be a good mentor or struggle with allocating the time towards it. Do you have any advice in this area?

Floria Mora-Kepfer Uy 40:11

Well, I think I'm still learning and hope, hopefully every day more and more how to be a mentor, and certainly have learned certain things that don't work. That's for sure. Field courses provide this hands on immersive research experiences in the field where a student will have a chance of interacting with a professor in a very distinct way where you're breathing eating science, and you're stimulated on the challenges. So this is a way to mentor students, not everybody will have the chance, or it may not be

their interest to do field biology. But this hands on mentoring through research is a very effective way to do this. And the other way is also to try to establish relationship with students, this is a very hard one, especially when you have a big lecture hall, full students, and you may not be able to interact with all of them. But I think there is a power to perhaps opening yourself up as a person a little bit and talking to students. I'm lucky that I teach first year students. Now I teach general biology. And I tell them a little bit about my trajectory as a scientist, what my interests are, to open up lines of communication. And I do say that if they want to talk about research to come to office hours, or if they need guidance, perhaps on what they're interested in, but also something that has been effective is that I actually sent out anonymous polls to students asking did this help what would help you otherwise? And that has given me a little bit more of a a better perspective of what what are the needs of students? So this little exercise has been it has been very effective. And sometimes I try a certain strategy, and I asked them. Did this work? Or do you have suggestions on something else? And I think that that has perhaps helped and that's going to change all the time. But I think also asking students, what would help you? Or we did this, what helped you from this experience? And what do you think would, what other things can we do, it allows us to also process the needs of different people and how to be able to mentor and sometimes it doesn't even have to be large efforts. Sometimes small efforts and doing tidbits of things can really have a cascading effect.

Amy Strauss 42:47

You perform research and run a field course in the Solomon Islands with your husband and co-PI, fellow biologist, Dr. Al Uy, this work was even featured in the Smithsonian Channel documentary "Islands of Creation". As I understand it, this work has a conservation focus, and you work closely with the local community in the Solomon Islands. Tell me about the work you do there.

Floria Mora-Kepfer Uy 43:06

This has been one of the most challenging, rewarding and fun experiences I've ever had at the old world tropics and the community in the Solomon Islands are just very inspiring. My husband, Dr. Al Uy, he had been working there for a while and speciation of birds his research. But interestingly, he had started with the idea of a field course there. And we decided to collaborate on this project. And we take a group of up to seven students, because this is a very off the grid experience, to be fully immersed in field biology and research for three weeks in the summer. And this is the first time that students experience being without power without internet. So it's completely off the grid. And we actually prepare them a lot. We have information sessions about this. And the idea is that these students will go through the whole experience of asking questions, designing experiments, collecting the data, analyzing and we've even had two publications out of these experiences. And it's amazing to see the ideas that these students come up with. And importantly, they understand how we're amazing collaborators in the Solomon Islands, the local community, how they understand nature, how they are naturalists, how they know so many amazing empirical ways of just knowing about patterns in nature locally. And actually we establish this partnership with the local community where a student is paired with one of the local rangers for the project so they learn from each other and they have these exchanges. Also with culturally, they also do a cultural project where they, and we live with the community. So this, the idea is

for students to become more citizens of the world at the same time as they are, you know, learning how to be a scientist and kind of being immersed in it there too.

Amy Strauss 45:20

Is this opportunity funded for students? Or do they pay their own way? Or how does that work?

Floria Mora-Kepfer Uy 45:25

As an immigrant, one of the things I experienced when I was younger is that there are things you can apply for being in the United States. And at the same time, even local students to domestic students may not everyone may have the chance to or afford a study abroad experience. And that was something that kind of baffled us, because we did not want to make this experience unavailable to many students that deserve to be able to explore, you know, their their interests as as young naturalist, so actually, we were able to secure some funding by the National Science Foundation. We are very grateful for it, and it actually covers for the tuition and the cost.

Amy Strauss 46:15

You're passionate about increasing diversity in STEM, beyond the strong mentoring and funded field opportunities you mentioned, what else is top of mind for you in this area right now,

Floria Mora-Kepfer Uy 46:26

I have to say that I feel this is a wonderful time in the sense that there's a lot more awareness and positive movement to just organically increasing diversity in science. And I think those of us that we have experienced some challenges in the past, we are very grateful for these wonderful steps towards achieving just the better and more natural way of interacting and making science just accessible to anyone who's passionate about it. And I would say that for people that really are keen on being allies, don't be shy in asking if something if they have a question about something or if they... they would like some guidance about, you know, maybe initiative that they want to put together I think that communication is key. And and to not be shy about asking other people formally or informally about mentoring tips or how to increase diversity. Ultimately, something I've learned is that very even small efforts can have really big and favorable and exciting consequences later on. So I think communication is very key. And we're in a very exciting time. So to really, I think we are all looking forward to communicating more with each other and learning from each other. So to not be shy to ask questions about it. If there's something you'd like to know, I think

Amy Strauss 48:00

Thank you for encouraging communication on this topic among all members of our field. I'd like to end with one final question, what excites you about the future of the field of animal behavior?

Floria Mora-Kepfer Uy 48:13

Oh, this amazing linking of proximate and ultimate research, I find that so exciting and fascinating. I am looking forward and developing these techniques to really be able to test and integrate knowledge. It's so exciting.

Amy Strauss 48:31

And that's a great place for us to leave it today. Dr. Floria Mora-Kepfer Uy. Thank you so much for joining us today. I enjoyed our conversation.

Floria Mora-Kepfer Uy 48:38

Thanks for having me.

Amy Strauss 48:40

And I've actually got a little bonus material here. I assigned some of Dr Mora-Kepfer Uy's work to my zoology class last year and one of my amazing students Elana Geary rewrote some lyrics inspired by this research. Enjoy!

Elana Geary 48:53

We decide we care brains is it. How can we see what makes us build societies? Social insects help us see beyond the trees and read about boundaries between wasp colonies and social species who decide they care about their own policies regarding who belongs there and where it even came from? It's brain structure and forbearers from evolution. Society developed to keep us safe. Because the world is full of strangers, who don't care. But if we can find a brood we can survive any danger. Why do countries go to war or ants start keeping score of who crosses the lines in the sand that did side my land from their land if it's about survival then we run experiments to see what makes us either accept or reject other beings who share a habitat it's not so simple if there are social contracts that decide what we will do if they attack. Society is built into our being...

Amy Strauss 51:14

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evolution. You can find a link to her website in the show notes. The Animal Behavior Podcast is produced with support from the Animal Behavior Society. Thanks for listening and we'll catch you next season.