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SPEAKERS

Zuleyma Tang-Martinez, Solimary García Hernández, Amy Strauss

Amy Strauss 00:08

You are listening to the Animal Behavior Podcast. I'm Amy Strauss. My guest today is Dr. Zuleyma Tang-Martinez, Emeritus Professor of Biology at the University of Missouri St. Louis. Her research focuses on the social behavior of animals, with an emphasis on the mechanisms development and function of vertebrate social behavior. Zuleyma engages in both experimental approaches and more conceptual approaches across many areas of animal behavior, and has received numerous awards and recognitions for her contributions. Beyond her research Zuleyma is actively engaged in service diversity and inclusion work and activism within and beyond the scientific community dilemma, welcome to the Animal Behavior Podcast. Thanks for being here. So to start, you've done extensive work on individually distinct odors that social animals used for individual recognition. And you describe these individual chemical signatures as like name tags or calling cards, how would you describe the function of a name tag or a calling card for a wild animal?

Zuleyma Tang-Martinez 01:06

Well see, I think that is the part that is really interesting about this. And if you don't mind, I can give you a little bit of history of how I got interested in individual odors. It actually started with my PhD. And I was interested in biological odors and pheromones, those sorts of questions. And at the time, the prevailing paradigm was that when mammals scent marked, that that scent mark was an aversive marker, in order to protect the markers territory. And so all of scent marking biological odors, was seen in a framework of territoriality, and of animals keeping other conspecifics from entering their territory by scent marking. And I was working with gerbils at the time. And what I noticed is that gerbils, actually, we're highly attracted to the olders of other gerbils. And that didn't fit with the idea that this is a territorial marking to keep outsiders from coming into your territory. And so I started wondering what else it could be if it wasn't a territorial marker. And it occurred to me that one of the characteristics that is probably typical of vertebrate societies, especially mammals, is that they can probably recognize each other individually. And so I decided to test that. And so I did that by habituation discrimination, in which you habituate the subject, the individual that you're looking at to the odor of one conspecific. And then you

present that same animal with an order from a different individual. So in my case, with the gerbils, what happens is that the subject immediately spends four time investigating the new odor that it has not been exposed to previously. And so this then tells you that that individual can detect differences between odors from individual A, and odors from individual B. Suggesting that different individuals have different odors, and that their conspecifics are able to detect those differences. And for me, what made that finding particularly interesting was that once you have an individual odor, then that can be used for any number of things. It can, in fact, be used in a territorial context, simply by saying, you know, I'm here, but it can also be used for other things. And one of the areas that I became extremely interested in was the use of individual odors for kin recognition. For me, much of kin recognition probably occurs by recognizing the individual odors of those individuals that you grew up with. So that's one example of a use in another context. So I think that individual odors and individual cues in general can have a whole range of different functions.

Amy Strauss 04:30

Cool. You started talking about how a lot of chemical communication we think about in terms of like territoriality, also, potentially in terms of courtship, right and mate assessment is that another context in which individual recognition is very likely implied for this kind of thing.

Zuleyma Tang-Martinez 04:46

I mean, I think in the visual recognition in the context of reproduction might be more important in terms of recognizing your mate or recognizing your parents or recognizing your offspring. And I also don't want to leave the impression that I think that all odors are individual odors. I think that there are odor cues that can attract individuals or can act as aphrodisiacs. So I certainly would not, in any way argue that the only function of odors is individual recognition. I think there's many, many different sorts of functions for biological odors. But I think that in mammals, individual recognition was something that, honestly prior to my work, I think had been overlooked as a possible function, because of emphasis on territoriality.

Amy Strauss 05:47

How widespread do you think individual odor is? Maybe within the animal kingdom or within mammals? Are there certain evolutionary sort of contexts that would favor the evolution of individual odors in certain groups?

Zuleyma Tang-Martinez 06:01

Well, I think that there are certain environmental characteristics that would favor the use of chemical cues. Certainly, social systems, the fact that a species has social lives and social groups would strongly favor the ability to identify individuals, just like in monogamous systems, or systems where males and females stay together for long periods of time, you know, even in polygynous systems, as long as there's continued association between male and the various females. I think that individual odors are important.

Amy Strauss 06:42

Yeah. Wow. Thank you. I want to talk a little bit about Bateman's principle. So this is a well known principle within animal behavior. It appears in many textbooks college courses, I certainly learned it and taught it and animal behavior classes. It's often used to explain behavioral differences in males and females. You've done substantial work challenging this principle. And I want to discuss this line of your research. So to start, can you just explain what the basic idea of Bateman's principle is?

Zuleyma Tang-Martinez 07:17

Yes, the idea that males increase the reproductive success based on the number of females they mate with, but that females after only one meeting reached the peak of reproductive success. And so consequently, according to that, then there will be greater variation in males in sexually selected traits and males will be more highly sexually selected than females.

Amy Strauss 07:49

So since this was published, the idea has been largely accepted as like a foundation of how we understand sexual selection until you began reviewing the evidence and challenging this narrative. What first got you questioning Batemans principle?

Zuleyma Tang-Martinez 08:05

Well, I would say before I go into that, that the other person who I think really deserves enormous amounts of credit for this is Patricia Gowaty. Because while I have done a lot of the conceptual work, Gowaty has done empirical work and has looked at Bateman's raw data and reanalyzed that and also found very, very serious problems. But what first got me interested in it, frankly, I also was taught Bateman's principles. And for many years, I thought it and it seemed to make intuitive sense in terms of the, especially the aspect that males produce an enormous number of gametes and with one ejaculation a male can fertilize all of the eggs that a female produces. And so it was very intuitively satisfying. But I started questioning it for the first time, when we began to realize that females in fact, were not monogamous. And when the whole issue of extra pair copulations came up, and initially the assumption was that females are either being forced into extra pair meetings by outside males, or that they were somehow being seduced against their choice. But it very quickly became clear that in many cases, in fact, in the majority of cases, females were seeking out extra pair copulations. And so the whole edifice of females only mate once with the one best male for me that brought into question the entire thing. At the same time, work had started with sperm competition, and obviously the only way that sperm competition can occur is if a female mates with more than one male? And so that was the point where I personally began to question Bateman's paradigm.

Amy Strauss 10:07

Yeah. Patty Gowaty I believe, and other scientists replicated Bateman's exact study as best as they could following those methods. Is that correct?

Zuleyma Tang-Martinez 10:16

Yes, that's, that's correct. And in fact, Patty used the exact same strains of fruit flies that Bateman had used, with one exception, a strain that had gone extinct, but she repeated everything in exactly the same way that Bateman had done his experiments. Bateman's experiment was done in 1948. And it really became popular in 1972 when Triver's wrote the parental investment paper and Trivers essentially revived Bateman because he had not been picked up by the scientific community until Triver's, but after that, it just took off. And everybody cited Bateman's work and it was considered to be the definitive explanation for sexual selection. But it wasn't replicated, or at least that we know of until Patty Gowaty did it in 2012.

Amy Strauss 11:18

And what did they find?

Zuleyma Tang-Martinez 11:19

Well, they found that they could not replicate his study and the major problem and Patty would be a better person, obviously, to detail this, but the greatest problem seemed to be that because Bateman was using mutant flies, that homozygous recessive flies were dying off before they eclosed into adults and Bateman, he was doing the counts by looking at mutant markers. And because you had the homozygous recessive, dying at a very high rate, all of those homozygous recessive flies were missing from his counts. And so when they took that into account, and in addition did another experiment that demonstrated that that is, in fact, what was happening in that there was an under counting.

Amy Strauss 12:10

Yeah, well, I'm glad that this study was replicated to sort of help understand what's really going on here. I know you have focused, as you said, on the more conceptual side, aside from the replication study, what have you found that refute the paradigm?

Zuleyma Tang-Martinez 12:25

Well, I've already mentioned a little bit the fact that if you look at female behavior, it is absolutely nothing like what was claimed by Bateman, and by many others, it is now known that extra pair meetings or meeting with multiple males by females is extremely, extremely common, and some people would say, virtually ubiquitous. So I think the way that people looked at it previously and the way that Bateman looked at it, and Trevor's, they don't coincide with the reality of the data that we are now

seeing. But but this is not to say that this idea is not controversial. I mean, I still get lots of flack from people who are...

Amy Strauss 13:17

Yeah, that was actually going to be my next question is have you received pushback from the community?

Zuleyma Tang-Martinez 13:23

Oh, yeah, definitely. I have been accused of having a feminist agenda for writing about this. And in general, some people's sort of, it's more like, you know, a pat in the head. Oh, Zuleyma. You're overdoing it. There may be issues with Bateman, but Bateman still holds. And it's still the most important concept in in sexual selection theory. So yeah, there's still pushback, definitely.

Amy Strauss 13:54

And then, I just quickly wanted to touch on so people have used Bateman's principle to talk about and explain and even justify human sexual behavior. Do you address humans at all in your work challenging Batemans principle?

Zuleyma Tang-Martinez 14:07

In most of my work, I don't talk about humans. However, I am very, very aware of the fact that Bateman's principles have been applied to humans in some ways that I think are extremely upsetting and detrimental. For example, I have written a little bit mostly in response to a paper that appeared in the sciences on rape as a human adaptive strategy. And I think that comes straight out of Bateman. I'm not saying that Bateman necessarily would have agreed with this ideas but I think that the proponents of rape as human evolutionary adaptive strategy rely on Bateman. So I've written about that. I've also written about human social biology and the problems that I see with that.

Amy Strauss 15:04

Thank you. So there's an area of work that you're currently working on. And this is challenging the idea that testosterone is immunosuppressive and acts as a handicap in sexual selection, can you sort of lay out that idea and then maybe talk about how you're going about challenging the idea.

Zuleyma Tang-Martinez 15:21

The idea is that testosterone is responsible for sexually selected traits in males. And simultaneously, testosterone is supposed to be immunosuppressive. So the idea then of a handicap is that only those males that are superior enough to be able to deal with the immunosuppression, and still develop this highly attractive, extravagant, sexually selective traits to attract females with that only those who are the best are able to overcome this handicap of having high testosterone. And what I'm doing in conjunction

with Stan Braude is looking at the evidence where you look at what the expectations are versus what the reality is. And we propose the idea that instead of immunosuppression, that what you might get with testosterone is something called immuno redistribution, where, for example, immune cells are moved from, let's say, blood from internal organs to places where there's likely to be a threat. And the reason that we proposed immuno redistribution is that we know that corticosteroids, which are known to be immunosuppressive also cause immuno redistribution, also. So the question becomes, is testosterone having an effect directly or indirectly? And part of what I have been concerned about with regards to this question is that you're dealing with two systems, you're dealing with the endocrine system, and you're dealing with the immune system. It's a little too simple to say testosterone causes immunosuppression, and therefore, it's a handicap. So looking at the much broader picture of what do we know and what does this tell us, and what can we really say?

Amy Strauss 17:27

Thanks Zuleyma. 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 take away

Solimary García Hernández 17:43

Hi, everyone, my name is Solimary. I'm at Columbia living in Brazil. I have study sexual selection, parental K and difference in behavior of arthropods and today, I'm going to talk about Ananteris a South American scorpion. This scorpion may become nutritious dinner for hungry rats, possums or even bigger scorpions. But if some predator grabs the Ananteris tail, we will see a desperate act of survival. The scorpions voluntarily detaches the last segments of the the tail to escape alive the predators. This behavior, known as autonomy is one of the most extreme of the animal kingdom, because what we call tail in scorpions corresponds to the latter half of the abdomen. So, after the tail is amputated, scorpions lose the single organ located at the tip of the tail, and they also lose the anus. After a few days a scab completely blocks the digestive system. And because the tail never grows back, the scorpions can never replicate again, and suffer from severe constipation for the rest of their lives. How do scorpions cope with the permanent loss of their tail? To answer this question, we performed a series of experiments in our laboratory. We found that tail autonomy has minimal short term effects on the locomotor performance of both sexes. In the long term, however, the accumulation of feces reduces locomotor performance, especially in males. And also as the scorpion loses the stinger organ, males and females that is still able to capture prey, especially the small ones. If you are also wondering about the sex opportunities well, so presently, the courtship behavior of males is not effective after their loss. However, they lose reproduction by the use of their survival, and because constipated females have less internal space for embryo development. Out of the mindset, females have fewer offspring that impact ones. In conclusion, the challenging moments that they will face while rolling capturing prey, and producing offspring are compensated but a long time between the loss and this time is enough for them to reproduce, which may explain the evolution of search and extreme form of defensive behavior.

Amy Strauss 20:13

Alright, we're back with Dr. Zuleyma Tang-Martinez, you were selected to give the Animal Behavior Society's inaugural JEDI lecture at the annual meeting this year, JEDI being an acronym for justice, equity, diversity and inclusion. And you've said this work is a real passion for you both personally and scientifically. First, what does JEDI work mean to you on a personal level?

Zuleyma Tang-Martinez 20:33

Well, on a personal level, I'm Latina, I'm a woman of color. I'm also an immigrant and both racially and culturally, I consider myself very much multiracial. And so in that sense, it's very personal, because I felt that I, frankly, by a series of serendipitous events that happened. I have ended up where I am now, which is a full Professor of Biology at an American university. And as a Latina, according to the US Department of Education, only 1%, of full professors in the US are Latinas. And so I have personally experienced what it means to be in a marginalized group, and what one has to do in order to quote unquote, make it, as part of a marginalized group. And I also, because of that, I always felt that I have a responsibility to open doors for other people. And so that's the personal part of my passion.

Amy Strauss 21:44

And then what does the JEDI work mean to you on a scientific level?

Zuleyma Tang-Martinez 21:48

On a scientific level, I think it's not only a matter of social justice, it's not only a matter of doing the right thing, or the moral good. But I also think that diversity improves our science. I think it is important because it brings in different perspectives and different points of views, and different ways of looking at things. And when I'm talking about diversity, I mean, I emphasize, you know, the racial, ethnic, cultural aspects of it, but even being a woman and I think that the influx of women into animal behavior has made a huge difference in the way that we look at things in what questions we find interesting in how we interpret data. And I think the same is true of all the other groups that have been underrepresented in science.

Amy Strauss 22:41

So this is something that you've been committed to for your whole career, it has gotten some particular attention in recent years, especially how have you seen the JEDI or diversity and inclusion landscape change over the years?

Zuleyma Tang-Martinez 22:56

Well, in the Animal Behavior Society, when I first became a member and started coming to meetings, which was in 1976, there literally were, four people of color, who you saw at Animal Behavior meetings. And in terms of Latin America, Hugh Drummond would come from Mexico, and he would usually bring

maybe two to three students with him. And that was it. That was the only representation of people coming from Latin America. And so now I look around, and I'm astonished and amazed at how much more diverse ABS has become. And obviously, you know, there are still groups that are very underrepresented in animal behavior. But in general, the society has really, really changed. And Latin American participation now is huge. For much of my time in, in ABS, we always met either in the US or in Canada. And only after we started seeing the influx of Latin Americans, that we start considering meeting in Latin American countries, and of course, Costa Rica, is the latest example of that.

Amy Strauss 24:17

It's great to hear that, that you've seen so much change throughout your career. And yet, there's still more to do.

Zuleyma Tang-Martinez 24:23

And I should add me that even the fact that we have this new JEDI plenary lecture series, I think is wonderful, because I think it demonstrates that the society is so committed to diversity and inclusion, that society considers it important enough that they're willing to devote, you know, an hour of ABS meetings specifically to talk in about that topic.

Amy Strauss 24:52

Yes, so you spoke a lot about the Animal Behavior Society specifically. You've served as Animal Behavior Society President. You're currently the historian of this society, you've led the Latin Affairs Committee, the Animal Care Committee and the Diversity Committee. You've been named a Fellow of the Society. And you've now received three ABS career awards, the Quest Award, the Exceptional Service Award, and this year the Exemplar Award. So you've clearly played a huge role in the society. And I know that your leadership of the line Affairs Committee and Diversity Committee are probably very influential in that change that you just described, how has the ABS played a role in your career trajectory?

Zuleyma Tang-Martinez 25:32

Well, I think the Animal Behavior Society has been a big contributor to my life into my career. And perhaps, this is easiest to understand, if I tell you about my first Animal Behavior Society meeting, this plus, in 1975, 76. I had attended a couple of scientific meetings that will remain unnamed, and was just... they were awful. I mean, you know, they were sexist, you sort of had the impression that, you know, half of the men there, at least a third were, you know, predators. At the time, I had just finished my postdoc. So I was a young researcher, and felt very unappreciated, very low interest on the part of the other people at the meeting. And it was such a negative experience to go to those meetings that I almost decided that I just wasn't going to go to meetings in the future. And then I saw that there was an Animal Behavior Society meeting, and I decided that I would try it. And it was, like 180 degrees. In the other direction. People were interested at my first or second meeting, WD Hamilton came up and to talked about a paper I had presented and had all kinds of ideas. And we had this fairly lengthy

conversation. And he walked away. And I said to somebody who wants that guy, and they said, that was WD Hamilton, and my jaw dropped. So it was very different. And I felt respect that I felt the guys at the meeting, were very respectful. And it was just a wonderful, wonderful experience. And I don't know if you know, but I think I hold the record for the most consecutive Animal Behavior Society meetings, because I have not missed one since 1976. And I look forward to the meetings every year, because not only do I get to see friends that I may only get to see, you know, once a year, but because it is just such a egalitarian society. And I think that also is one of the reasons why ABS with a little bit of pushing, but not that much made the transition to make JEDI work. So important. And so I've often said that ABS is like my other family.

Amy Strauss 28:10

That's amazing. And I know that you being at those meetings every year, I think earlier in our conversation, you mentioned a responsibility as a Latina, academic in this field to sort of open doors. And I am sure that all that you've done for the society over the years, and has done that for many people. So I think sort of along these lines, and also sort of in your role as historian in 2020, you published a paper in animal behavior, called the history and impact of women and animal behavior and the ABS a North American perspective. And one of the things, among others that this paper does, and this is a quote from the abstract, is that this paper examines the synergism between the influx of women into animal behavior and novel advances in the field. Which you also mentioned, and also sort of links to you speaking of the society as this more welcoming society than maybe some of the others that you experienced, can you share some examples of the synergism of influx of women into the field and novel advances in the field?

Zuleyma Tang-Martinez 29:11

Yeah, one of the areas in which it is most obvious is in primatology. And I think that the study of primates as a whole was completely changed by the influx of women, specifically, prior to the huge influx of women with some very few but notable exceptions, most of the work that was being done concentrated on aggression, and dominance hierarchies. And in fact, you know, when I started out as a student, the assumption was that if you study primates, and you were able to determine their dominance hierarchy, that's all you really need to know. And then you had, you know, people like for example, Thelma Rowell who was at Berkeley, Jeanne Altmann, and other women who came in and started to look at the importance of infants. In primate societies, you started looking at the importance of female coalition's and female friendships. Lo and behold, you know, turned out that some female primates are dominant to males. And so the original ideas, little by little began to fall by the wayside if you want and new ways of looking at primate societies evolved.

Amy Strauss 30:37

Why do you think that animal behavior has been inclusive towards women over recent decades relative to other scientific disciplines?

Zuleyma Tang-Martinez 30:46

You know, that's a really good question. And I don't know that I necessarily have an answer. I think the Animal Behavior Society specifically, think that the fact that it started out from its very founding, valuing the principle of equality, at the time when it started, it was more equality between faculty and students. Students had as many rights and were encouraged to be as involved as the faculty, many societies of the time were run by Silverback males, essentially, who formed little cliques and made all the decisions. And I think that we, as a society did not have that same framework. And we're more egalitarian from the beginning. But I don't know, it's something actually that I wondered about myself, because it is clear that women in animal behavior, not at the very beginning, there were only three women among the founders, but fairly quickly, women came to play a very important role in animal behavior.

Amy Strauss 31:57

So I want to just close our conversation with two broad questions. So the first one is, what advice would you give to students and early career researchers in the field of animal behavior?

Zuleyma Tang-Martinez 32:10

I would say follow your interests. Follow whatever you feel passionate about. Try to balance career with life, and relationships, if that is important to you, and I think it is important to most people, and don't be afraid to question. Don't be afraid to say, well, you know, this particular idea may be mainstream, but I'm not sure if this is right, or this doesn't make sense to me. So those I think, would be the most important things.

Amy Strauss 32:51

Those are great. And you are a great example of doing those things. Alright. My second closing question is what excites you about the future of the field of animal behavior?

Zuleyma Tang-Martinez 33:02

Oh, gosh, okay. Well, I think one thing that excites me is that there is still so much to be learned, you know, and there have been times even as to retirement when I have thought, gosh, if I were starting over again, as an animal behaviorist, you know, where would I go? Would I do the same thing? Or would I do something different, but I think the bottom line for me is that there is just so much still left to learn. And it's like I said, before, you know, the, one of the reasons that I love animal behavior so much is because of curiosity. And because it is so complex, and it's so integrated, it brings in so many different fields. And I think that's still true. And we've done a lot, and we've accomplished a lot. And we have taken some directions that I think we're not necessarily good directions like specifically, human sociobiology, but sociobiology more broadly. So I think that, you know, we have made from my perspective, and obviously not everybody's going to agree with that. We have gotten in some directions that I don't think were necessarily the best directions to go in. But at the same time, I think we have learned so much about animals, but yet there is still so much more left to learn.

Amy Strauss 34:27

Great. Well, thank you so much for joining us today. We touched on lots of different things. We could have probably talked for much, much longer on all of those topics and more, but it's really fun to talk to you and I really appreciate you taking the time.

Amy Strauss 34:35

The Animal Behavior Podcast is created by a great team of animal behavior researchers and science communication professionals, Matthew Zipple and I prepare and conduct the interviews. Our content editing team is Naomi Person, a longtime radio producer, Poppy Lambert, a comparative cognition PhD student studying physical cognition and tool Innovation at the University of Veterinary Medicine, Vienna, and Niko Hensley an NSF postdoctoral fellow studying the evolution of neuro sensory systems and their impact on animal communication at Cornell University. Our communications director is Casey Patmore, a PhD student at the University of Edinburgh studying the behavior of burying beetles. You can follow us on Twitter at @AnimalBehavPod, or find us at our website animalbehaviorpodcast.com, and you can always get in touch by email at animalbehaviorpod@gmail.com. We'll be rolling out our website throughout this season including new educational resources that will accompany select episodes. Those materials are being developed by our new education team. Emily McLean, assistant professor of biology at Oxford College at Emory University, and Georgia Lambert, a PhD candidate studying parental cooperation and burying beetles at the University of Edinburgh. Our sound director is Brian Leavell a PhD candidate studying the evolution of acoustic signals in Ximena Bernal's lab at Purdue University. This season, Matthew's conversations are being recorded in the Cornell Broadcast Studios with engineering support from Bert Odom-Reed. Our art is all produced by animal behavior researchers. Our logo was designed by Adeline Durand-Monteil our theme music is by Sally Street and transitions are by André Gonçalves, we receive financial support from the Animal Behavior Society. Finally, if you like the show, then you probably know other people that would like to show to but don't know about it yet. Do them and us a favor and tell them about the show. Thanks for listening and see you next time.