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SPEAKERS

Guest, Stump The Chump, Jamie, Amy

Jamie 00:10
Welcome to Two Bees in a Podcast brought to you by the Honey Bee Research Extension Laboratory at the University of Florida's Institute of Food and Agricultural Sciences. It is our goal to advance the understanding of honey bees and beekeeping, grow the beekeeping community and improve the health of honey bees everywhere. In this podcast, you'll hear research updates, beekeeping management practices discussed and advice on beekeeping from our resident experts, beekeepers, scientists and other program guests. Join us for today's program. And thank you for listening to Two Bees in a Podcast. Hello everyone, and welcome to another segment of Two Bees in a Podcast. This will be part two of our interview with Dr. Keith Delaplane, who's a professor at Walter B. Hill, Fellow Honey Bee Program Director in the Department of Entomology at the University of Georgia. I hope you enjoy.

Amy 01:12
Dr. Delaplane, what drove honey bee speciation?

Guest 01:16
Yeah, well, thank you. What I've been saying up to this point, Amy, I was kind of focusing on the history of the genus Apis. We talked about the significance of the curtain of living bees over a single comb. We talked about the innovations of moving into a cavity, which freed that curtain of bees into other activities, which increased the size and social complexity of the colony. So that is talking about the genus Apis. Let's talk now about the species Apis mellifera. And I think we've talked earlier about, what are some of the questions outstanding of what made the mellifera ancestry uniquely Western in its orientation? And I do think that the "out of Europe" model is the best explanation for that question, why is mellifera so uniquely Western in its natural distribution, and the "out of Europe" model provides a good answer for that question. So now we have a species mellifera stretching from the African Cape all the way to the Arctic Circle in Scandinavia. That is a huge swath of diversity of planet Earth's real estate. Let's zero in, just for the benefit of most of your listeners, I think, on Europe. We had populations of cavity nesting Apis now occupying Europe. And then we start talking about the glaciers. The glaciers is one of the best textbook examples we have of not just speciation, but in our case, Amy, subspeciation. How did the different races of mellifera evolve? And there's two really good case histories that I want to focus on, both of which involve glaciers. Listeners, can I refresh on your

European geography? We have a couple mountain ranges that I want to talk about right now. The first is the Pyrenees, and this is a series of mountains that runs in kind of a northwest to southeast vector, and it forms the boundary between modern day Spain and France. The second range of mountains I want to talk about is the Alps that separates Northern Italy from Switzerland and Austria and other countries north of it. When you have glaciers, the glaciers form and linger longer in mountainous regions, and so The Pyrenees and the Alps both experienced heavy glaciation at different periods in their history. When you have a single species spread across a wide patch of range, there's a couple ways in which that large, diverse population can end up being a different species. One could be you just have accidents that happen. You have changes in climate here and there. You have an earthquake that causes a ravine or a strait of water where formerly there was none. You have just accidents, you have a plague, you have a disease, you have an epidemic, you have a new predator move in. Lots of things can bust up that homogeneous population into little smaller clusters. And if those disruptions persist, then those populations can no longer interbreed. And given enough time, they can evolve into different races. Given into even more time, they could eventually evolve into different species. I think that's an important point to make here is that species break up into subspecies, and if the separations continue, then subspecies can actually separate into different species. So subspeciation is just simply speciation earlier in the process. There's a second way that this can happen if you have a physical separation, and this is where the glaciers come in. So we have the ancient subspecies, Apis mellifera mellifera, which we call the modern Northern European honey bee, which was comfortably extended, essentially, all across northern Europe. When the glaciers separated modern day Spain from France and the rest of Europe, then those populations were separated from one another, and they could no longer interbreed, given enough time. This gave rise to two different races, Apis mellifera iberica, or the Spanish honey bee, and Apis mellifera mellifera, the Northern European honey bee. The same kind of process happened in the Alps. We had a different global biotype of mellifera that had come up around from Africa, from the east, around the Black Sea, and colonized Europe from that direction. And when the Alps were glaciated, the Italian sector of that population was cut off from the rest of its European cousins. And given enough time, they evolved into two different races, the modern day Apis mellifera ligustica, or the Italian honey bee, and Apis mellifera carnica, the southeastern Asian honey bee. Those populations were divided by just simple geographic barriers, in this case, the glaciers. So modern day beekeepers have the glaciers to thank for some of the most modern, economically important subspecies that we're familiar with, the good old Italian honey bee, the Carniolan honey bees, the Caucasian honey bees, the Spanish honey bees. Remnants of the Spanish honey bee, by the way, are still detectable in southwestern United States, because it was Spaniards, European Spaniards, who colonized that part of the New World. And of course, they took their Spanish honey bee with them, and so to this day, we still see genetic ghosts of Apis mellifera iberica in the southwestern United States. Interestingly, some mitochondrial DNA work has shown additional evidence for this. If you look at the coasts of Spain and France at the north of the Pyrenees and the coasts of Spain and France at the southern end of the Pyrenees, you find spillover of Apis mellifera iberica, for example, moving into France and Apis mellifera mellifera moving into Spain. In other words, you see spill over exactly where you'd expect it, at the terminus of the mountain range, at both the north and south end, which just reinforces the fact that it was the geographic barrier of the Pyrenees plus the glaciers that separated mellifera into those two races. And we see the same thing happening in the coastal regions of eastern and western northern Italy. You see spillover of carnica into those zones, and you see spillover of ligustica into the European continental part of those zones. And that, again, reinforces the absoluteness

of that glacial barrier on top of the Alps mountains. And so that's kind of the two classical ways in which a population of a species can bust up into different races and given enough time, whole new species.

Jamie 08:39
I want to remove humans from the picture because we have been primary movers of Apis recently. I want to think back before humans were doing this, and you've talked a little bit about it, but could you elaborate a bit more on some of the environmental drivers of honey bee dispersal? So you talk about speciation and subspeciation, but did the bees move themselves? At some point, they needed to go either into Asia or elsewhere. So how do these things happen?

Guest 09:06
There are two primary routes from which mellifera could move around Western Asia, Africa, and Europe. One of those routes is the existing land bridge, which still persists to this day, across the Levant, far western Asia, modern day Israel, Egypt, Syria, Lebanon, and on up into Turkey, the Anatolian route, if you will. That route is quite straightforward to our imagination, because it exists today. But then we have another very plausible route, and that is across the isthmus, or the near isthmus of Morocco, where the Mediterranean joins the Atlantic. It is not uncommon, not unheard of, for species to raft. We have no reason to think that that mouth of the Mediterranean was ever terrestrial, but it has been narrow in its long history, and species can raft across bodies of water and still spread, even if a gap of water is too wide for a colonizer to fly, for example. So those are the two most plausible routes. And it is also not an accident that the Apis mellifera of southern Spain is very, very similar genetically to the Apis mellifera of Northern Morocco. So there's very clear genetic evidence to support that those populations did mix at some point in their geographic history, and it's probably from rafting. Interestingly, we have another example of this at the end of the Sinai Peninsula, near the Horn of Africa. And there is a subspecies of mellifera, Apis mellifera jemenitica, which occurs in both the southern Sinai Peninsula and the horn of Eastern Africa. And there was a period in our geologic history when that region of the world was connected. There was a land bridge at one point between the Horn of Africa and Southern Sinai, which makes a very straightforward explanation of why those mellifera populations are close in kin. That's what exciting about studying natural history is you find not one but multiple streams of evidence pointing to these events. And it is the job of the philogeographer to try to piece together all of these and come up with a model that is the most coherent. It's a lot like forensics. We never know for sure, but we can piece together the best evidence that we have. And because of the genomics revolution, the quality and quantity of our data are just increasing enormously. I tell beekeeper groups that, for many years, our understanding of genetic relationships was limited simply by the speed of our computers. But now that we're getting computers that can handle the enormous quantity of genomic data that is available, and it is resolving these relationships tighter and tighter with more and more time, and the speed and rapidity at which these revisions happen is also quite fast and has been very active with mellifera for the last 10 years.

Amy 12:17
So, Dr. Delaplane, you described some of the subspecies. We know that Apis mellifera is represented by 30-ish subspecies. Depends on who you ask, I guess. Could you talk about some of the characteristics that are common to the lineages of Apis mellifera?

Guest 12:39
All Apis mellifera are truly eusocial. By that, we mean that we have reproductive division of labor. You have some individuals who do not reproduce so that others may reproduce. They work on behalf of those who can reproduce. We also have cooperative brood care. They are helping produce the common brood. And then we have, thirdly, that overlapping generation. You have individuals who are born in that nest, and they stay at that nest. And incidentally, it's that third one, overlapping generations, that is invoked when we have conversations about whether humans qualify as eusocial species, and that gets back to something I was talking about a while ago, about the menopausal human female who, in many cultures, remains at the quote, nest, or the home, and helps rear her grandchildren. And this is straight out of the eusocial textbook, and helps us think of Homo sapiens as a eusocial species. So this is held in common. Another thing held in common with other eusocial bees is the possession of a corbiculum. And the corbiculum is a complex anatomical piece on the hind legs of bees which is specialized for pollen carrying. A general pollen carrying apparatus is nothing more than long hairs, either on the leg or on the ventral surface of the bee. But the corbiculum is a little more specialized. It has a flattened area that is hairless and concave into which the bee can pack the pollen grains. What is curious about the corbiculum, Amy, is that there is no obvious connection with eusocial behavior, because we have eusocial bees who do not have corbicula. We have social bees that do not possess a corbiculum, but it is common across all of the Apis. The bumble bee has a corbiculum, for example, and in North America, that's really the only two bees that you'll ever encounter that have corbicula. If you lived in Mexico, in Central and South America, you would encounter the stingless bees, and they, too have a corbiculon. But it's kind of an odd ball. It's probably just a piece of genetic baggage that glommed on and never got lost. But that is also shared in common with Apis. Another thing that's common across all Apis is group swarming. Apis is perennially eusocial. It never, ever phases in and out of sociality. It always expresses those three criteria that I talked about earlier: cooperative brood care, overlapping generations, and reproductive division of labor. It never is not expressing those three characters. Bumble bees, on the other hand, do. Bumble bees phase into a solitary stage. You have the reproductives produced in late summer, they mate, and they all die, except for the newly mated queens, and they alone hibernate as singletons and come out the next spring and start a colony solo. Honey bees cannot do that all. Honey bees are perennially eusocial, and that means that they are obligated to group fission, or splitting together as an entire colony. This is a very costly form of reproduction because you're essentially taking the body of the superorganism and splitting it in two, like a paramecium would, and making sure that both halves have germ cells, and that would be, of course, a mated queen who can then propagate the new colony. It also explains, Amy, why they, in the temperate regions, at least, why they have to swarm so early in the year. They have to do that in temperate regions because this allows the maximum amount of time for the new swarm and the parent colony to recover from this crisis, to recover from that stress of fissioning their body, the superorganism, and rebuild a foraging force and rebuild a food supply so that they can survive the next winter. And these are some of the behaviors that are in common across all of Apis. What is not common is the loss of migration in the temperate Apis. European honey bees do not truly migrate. That is resource driven, where the whole colony gets up and moves to another location. European Apis cannot do that. They have to stay put in one spot and make a really heavy nest full of honey. I think it's no accident that it is the European honey bees that have made their way into commercial scale beekeeping. It's that habit of forming a large population that can make a large honey supply so they can survive the next winter. It's those habits that beekeepers exploit when we manage them to maximize

their honey crops. So there you go. I think that's kind of a brief discussion of some things in common across all of Apis.

Jamie 17:59
So, Dr. Delaplane, that's utterly fascinating. You've covered a lot of things that I really want to read about. You've mentioned already that your book will be published this year. That's 2024 for listeners who are listening to this, well into the future. November of 2024 this book will come out. I can't wait to see it and read it. You've talked about things that really have drawn my interest, and I want to know more. But Dr. Delaplane, it's really impossible to wind up this podcast with you nearing retirement, just a few days from retirement, without specifically reflecting a little bit on your career. You mentioned that you've been working on this book as your magnum opus for the last nine years. But on the other hand, you've spent 30+ years working on behalf of beekeepers, doing applied research in many ways, in many different contexts, Varroa control, integrated pest management, polyandry, and on and on and on and on. So I feel like we can't conclude this podcast without letting you wax eloquently a little bit about your career. If you're on your way to retirement, what do you want to leave the industry with? Remember, we got beekeepers from around the world. This is kind of like your chance to reflect. Like, Jamie, I've done these things, here are things I think are important for beekeepers to note. So what is that? What's that advice you want to leave us with, Dr. Delaplane?

Guest 19:20
Wow. How's that for an open-ended question? Well, I want to state again, as I had before, I am a strong believer in public education, the public research university, and those of your listeners who are fortunate enough to live in states and municipalities that fund those institutions, please believe me that they are worth every penny of tax money that they get. It has been an honor for me to work for an institution that genuinely and authentically values original knowledge, that recognizes the value of the research dollar. And there is, at a societal level, there is no better investment of public monies than in research. That applies to practical research, solving beekeeper problems, and it applies equally to fundamental research, digging into the deep biology. I hope, as an example of the latter, my earlier conversations about the natural range of Apis mellifera and the fact that mellifera has never, ever, ever in its geologic history, had an Asiatic mite. This is an example of the importance of basic science because, if we go back and look at the evolutionary story of Apis mellifera and its lineage, it helps us understand just exactly how realistic is it that we could breed honey bees to be resistant to Varroa mite? Jamie, I think this is one of the most burning questions that many of your listeners may have on their minds. It's certainly a burning question that I have. What I have to offer to the conversation is this evolutionary history, and they just raise the question, what grounds do we really have to have a genetically resistant honey bee to Varroa destructor? I do not think it's impossible. I do, in fact, acknowledge that there are cases around the world of populations that can measurably resist certain elements of mite biology. I want to hasten to add, though, that in every one of these cases, it has been an example of usurping another characteristic of the honey bee that had been evolved for another purpose, using another tool designed for another problem, and co-opting that tool into a very, very modern problem, and that is this exotic mite, Varroa destructor, that has only in the blink of time, geologically, been present on Apis mellifera. I say all that just to contextualize the industry's hopes. It has proven in our lifetimes, yours and mine, Jamie, and many of your listeners, I would say, that breeding a truly sustainable honey bee that is reliably resistant to Varroa destructor at an industry-

changing scale has proven almost impossible. I think it is incumbent upon all of us who work in this industry, those of us who think about this industry to ask ourselves, why? Why, after so many decades of focused effort, are we still lacking an industry-changing bee that simply resists Varroa destructor? I think the evolutionary history that I have painted briefly in this interview gives us clues to that reason. We're asking an awful lot. We're asking something of mellifera that it may not even possess, and that is a native resistance to these parasites. And we come along in our brief human lifetimes, and we think that we can change that. I think it's hubris, at the very least. I don't say that to discourage those who are working on breeding programs. To the contrary, even if you do co-opt another behavior, such as brood hygiene that was evolved for controlling chalkbrood, and if you find that it does provide some benefit for Varroa, that's good, but we have to always be asking, how good does it have to be? And as long as we always have to default back to chemical treatments, then I would say it has failed to achieve the bar of industry-changing difference. I want to stress those words, industry-changing difference. Consider, for an instant, the Holstein dairy cow. The productivity of the Holstein dairy cow is without controversy. There's a reason why the Holstein dairy cow dominates dairy production around the developed world. Its productivity is unimpeachable. It's not controversial. We do not have a bee like that in the world of apiculture and Varroa mite resistance. So I want us to just keep our expectations realistic, to understand the inertia of the natural history that is resisting us when we casually think that we can breed for resistance. That's one big thought, Jamie, to come out, and I know that's going to stir a lot of opinions, because I know I'm stirring in a hornet's nest. But when you're getting ready to retire in a couple days, you can say things like that. I want to say one more thing, and that kind of springs right off of what I just said. This is more Keith Delaplane talking than Keith Delaplane the scientist. This is Keith Delaplane the human talking. I have a problem with taking an animal out of its natural habitat and fiddling with it, and then failing to give it what it needs to survive the problems that I have caused it. This is essentially what lies behind this idea of, "let alone beekeeping," where you just let the survival of the fittest, so to speak, carry the day. I have a problem with taking a natural animal out of the hollow trees and fitting it into my Langstroth hives and then saying, "Okay, now I'm not going to treat you for Varroa mites, even though it's my species that made this problem for you in the first place." I've got a problem with that. I do not think -- there is no other sector of agriculture in which we behave like that. What hog farmer do you know that practices that philosophy with her hogs? What dairy farmer uses that philosophy with their dairy cattle? That is, to me, just utterly bizarre that that philosophy has such a strong foothold in beekeeping. We take these animals, we put them into our equipment, we subject them to our management, and then we don't manage for Varroa mites. I think that's irresponsible, and that kind of springs naturally from what I was saying earlier. We're asking an awful lot of Apis mellifera to truly be resistant to Varroa destructor, and Varroa destructor is the number one problem of our generation. I think those two opinions need to be out there and to be frankly discussed among scientists and among beekeepers. I love this animal and I hate it when they are not treated and cared for. We would not do that to our dog. We would not do that to our agricultural animals. Why in the world do we think it's okay in our managed honey bees?

Amy 27:13
I think those are some great points, Dr. Delaplane. Jamie and I talk about the ethical considerations of managing Apis mellifera. I think our listeners have heard that every so often in our messages, and so we appreciate you helping reiterate that point.

Guest 27:27
Well, thank you. And that's the advantage of having a near retiree on your docket that can say crazy things.

Jamie 27:32
I know. I was like, good, gracious man, now you're gonna leave and we have to continue this podcast.

Guest 27:37
I'll let you clean up the mess.

Amy 27:39
Yeah, he's gonna delete his email. Nobody can contact him after this.

Jamie 27:42
Even if I agree with many of the points you just said, wholeheartedly. We actually, Amy is right, we do talk about this idea. If you're going to keep bees, you need to keep bees, and I firmly believe you have an ethical obligation to take care of it. Letting it starve because you're against feeding, letting Varroa kill it because you're against treatments, is just mind boggling to me. But, on the other hand, we're combating that through extension. So I support what you said.

Guest 28:04
Well, thank you.

Amy 28:05
So I jokingly said that, by the time this podcast comes out, you're going to be sipping margaritas on an island somewhere. I was only half joking when I said that.

Guest 28:13
Well, actually, it's a very good idea. I kind of like that.

Amy 28:15
Yeah, you're welcome.

Guest 28:17
It would probably be Scotch in Scotland, though, instead, but --

Amy 28:20
That's fine. Yeah, whatever you want to do. That's up to you. But, my last question for you is, what is next? What are you going to do? What are you going to be doing when this episode comes out?

Guest 28:31
Well, first thing, my wife and I -- my wife is German, and she has a lot of family left in Germany, and my German is terrible and needs lots of practice. So we're planning on doing a lot of travel into the European continent. I've just got lots of friends and lots of affinity there, both personally and

professionally. That's where I've spent much of my professional time. And I just simply love a lot of aspects of Europe, and we plan to spend a lot of time there. But for those days when we're not traveling, you wake up in the morning, what are you going to do? Well, as you might imagine, I've been kicking around a lot of high order thoughts the last several years as I wrote this book and things like, what does my scholarship and my research and my writing on honey bee social evolution, what does that have to say about life for humans? What does that have to say about how we should live together? How should we treat one another? How should we treat the non-human biosphere? I think what I've studied and the opinions that I've formed in writing this book have given me some other ideas that I want to talk about. I want to unpack some of those at, I think, a larger scale, perhaps for audiences that aren't just beekeepers, audiences that are maybe not just naturalists, maybe a more general readership. And I hope that I can experiment with different audiences, writing for different audiences. Also, practicing my art. I've long had an interest in 2 dimensional art. My wife is also a painter. I look forward to channeling more energy into that as well. All my friends tell me, promise me, in fact, that I will be more busy now than I was when I was working, and I think they are probably right. I already see clues to that. I'm looking forward to it. My wife and I are still healthy and feel fit, and I want to take full advantage of those years.

Jamie 29:57
There are so many ways, Amy. Gosh, there are so many ways. One of the great ways to start is there are a lot of message boards online about honey bees and beekeeping, and there are a lot of social media platforms and chatrooms, etc. about honey bees and beekeeping. Instagram, X, Facebook, Reddit, all these kinds of places where people go online and talk about bees and beekeeping. Those will often be places where people advertise jobs, or those are also places where someone can go online and say, "I want to help beekeepers keep bees, I want a job in beekeeping. What are some opportunities for me?" In the US, at least, there are two national periodicals, Bee Culture and American Bee Journal. Oftentimes, those journals have in the back "Help Wanted" sections. So you can go back there and a take a look. I know that other international bee journals might be the same, so always checking bee journals. Going to local bee clubs, wherever you live on planet Earth. There's probably a local bee club somewhere close to you, and you can express your interest in helping beekeepers. Obviously, there are usually more jobs in the commercial realm than there are in the hobbyist realm, so looking out for commercial beekeeping organizations in your area. In the US, we've got state level organizations, regional level organizations, and even national organizations. And the same is true in many countries around the world, so hitting up those beekeepers. I even see in some of the kind of agriculture related periodicals, so for example, here in the US, that might be Farm Bureau related periodicals as an example, that often have "Help Wanted" sections, and occasionally, I'll see beekeepers in there. In the US, you've got the added benefit of being able to reach out to county extension agents or your state specialist at the universities, usually your land grants, to see if there are people who need help. And there are equivalent groups in other countries as well. So there really are a lot of ways, but honestly, social media today reaches so many people that it's really easy to just find positions through there. As always, you need to be careful anytime you're responding to someone's interest in providing a job, because there are some shady situations and characters and organizations out there. So it'll be up to you to make sure and vet that. But, there's a lot of jobs available in the honey bee world if you're interested in working. Honestly, there are jobs that aren't even specifically related to beekeeping, but they might be at academic settings or at a USDA setting or science labs. I mean, we

hire people at University of Florida all the time. My colleagues around the world are similar, technicians, all kinds of things, undergraduate students, hourly labor, and so many people can come in and help in so many places. So there's really a lot of places to find potential employment opportunities in the bee world. Well, Dr. Delaplane, there are many ways I could conclude this. I've known you for a very long time. Now that I think about it, it's been over 30 years. In many ways, you've watched me develop as a person, but I've also returned the favor and watched you develop. I know that in my early days, you were fixated very heavily on Varroa, IPM, controlling Varroa. That was my inital experience with you from a research perspective. On behalf of scientists, and myself, who considers you a mentor and someone to emulate, and also on behalf of the beekeping industry, I just want to say thank you for what you've done for honey bees and beekeeping. I do hope you are met with success, fulfullment, and enjoyment in your retired life, which sounds like it won't be overly slow. It sounds like you'll still be contributing academically. I hope that you always continue to work with the organism that made this all possible for you. So happy retirement, happy everything, and a hearty thank you for not only joining us on this podcast in the short-term, but also, more broadly, what you've done for me personally, but also, the industry and, frankly, the honey bee. Thank you.

Guest 31:35
Well, Jamie, that means an awful lot to hear. And I especially appreciate hearing it from you. I acknowledge our long time together. I'm grateful to watch you and see how you have likewise benefitted from this wonderful animal. I couldn't echo your sentiments more. So thank you for having me. I'm glad to be here and glad to have been here.

Amy 32:06
Jamie, it's so obvious. I think every one of our listeners know that you went to the University of Georgia, and that Keith has done a lot as your mentor, and that it's helped you succeed as well. Like you said in the interview, you've watched him also go through his career. So it's really great, and I'm glad to be able to have him on our podcast as a two-part series, which was kind of cool and really fun. Like you said in the episode, we could just pick his brain all day. I could listen to Keith talk about his entire career, his research, and everything like that for days and days.

Jamie 32:40
Well, Amy, it's hard to know where to comment about that because I've been at the University of Florida for 18 years, which means there's a big, huge chunk of Dr. Delaplane's professional career that I haven't interacted with directly. My knowledge of him was the 15-20 years prior to that where I was an undergraduate student at the University of Georgia. I even knew him before that through my 4-H and science fair days. All of those days, it's all about controlling Varroa, honey bee colony health, when I did a postdoc with him, small hive beetles were brand new so it was about killing small hive beetles. Inasmuch, like you said, he has watched me develop professionally, I've watched him develop professionally. In those last 18 years, he's been branching out into these broader things like why is honey bee polandry important? Of course, this two-part series where we talk with him about his upcoming book and all the main things from that book, honey bee evolution and biogeography and what it means for our own species. So I've watched his career develop from heavy applied research to this heady, thought-provoking science that honey bees open up for us. We are very fortunate to be able to have him join us for this kind of two-part interview that, hopefully, you listeners out there have been

able to enjoy as we've kind of encapsulated his most recent work, but even been able to harken back briefly on what he's done for honey bees and beekeepers throughout his career.

Amy 34:14
Absolutely. Just a reminder, he said that the book is coming out in November of 2024. Right, Jamie?

Jamie 34:20
That's correct, yes.

Amy 34:22
Listeners, stay tuned. As soon as that comes out, we'll be able to promote it on our social media pages, on our listservs. We're just really happy to have Dr. Delaplane on to discuss his career, his book, and share all of his knowledge.

Stump The Chump 34:45
It's everybody's favorite game show, Stump the Chump.

Amy 34:55
Welcome back to the question and answer segment. Jamie, the first question we have is do drones exhibit hygienic behavior?

Jamie 35:04
Alrighty-o, Amy, they do not. Again, you and I talked off the air about this specific question. My guess is, based on the next question that's going to come up, and I won't steal your thunder, is that the questioner was really talking about grooming behavior. But I will answer the question exactly the way it was asked. It was asked, do drones exhibit hygienic behavior? Hygienic behavior is a very specific behavioral response where worker bees can detect diseased or parasitized immature bees, so larvae or pupae, and remove those immature bees from the cell in which they are developing and then out of the hive. So hygienic behavior is often used as a term to cover everything bees do to clean the nest or to remove brood or to groom themselves, but it is a very specific behavior. And it really doesn't matter how you define hygienic behavior, cleaning the nest, removing diseased or parasitized brood or grooming oneself. Drones don't do any of the three of those because drones don't really have the capability to engage in hygienic behavior. So to answer the very specific question, they don't exhibit hygienic behavior. But I won't answer the next thought until you ask the next question.

Amy 36:21
Ok, well here's my thunder, then. I guess there are a couple of things with that. Drones don't exhibit hygienic behavior because that's what the workers do and drones just don't do that in a colony. But, do drones exhibit grooming behavior and/or do workers also try to groom drones? Those are two questions, Jamie.

Jamie 36:45
Drones do not groom themselves. That is a worker task. Drones can approach workers and allow themselves to be groomed. Grooming is basically the behavior of bees where they are -- gosh it's kind

of hard to conceptualize -- they're cleaning their bodies. They're removing debris. It's any behavior that involves them taking care of the outer part of their body. So that can include pulling Varroa off themselves or off one another. So drones do not groom in the sense that the question asks. They might clean their antennae, for example, before they fly, but they do not groom in the sense that they are cleaning their bodies or removing Varroa off themselves. That is a task that drones rely on workers to perform. So workers will groom drones. They will also attack Varroa that are on drones. Grooming is a heritable trait, so some workers and some colonies are better at this than are other workers and other colonies. So, it's a very interesting defense mechanism that bees use to keep themselves clean, as it were. That's why, I think, a lot of people think about the word hygienic -- clean, sterile, all of that stuff -- and why a lot of people would feel grooming behavior might fall under this particular behavior. But hygienic behavior refers to removal of diseased brood, whereas, in this case, grooming refers to cleaning the body or picking Varroa off the body of themselves or another bee.

Amy 38:12
And you kind of wonder, at what point does the worker bee decide, yeah, this is just too many Varroa. I am not going to try to groom this off of you?

Jamie 38:20
Well.

Amy 38:21
I mean, I don't know.

Jamie 38:22
I don't know the answer to that question. I would say, again, some workers are better at this behavior than others. Even, let's just say one mite. There are some workers that might be oblivious to the fact that there's one mite on a drone that needs to be removed, whereas that one mite threshold is more than enough to cause other workers to want to get that mite off the drone. So I don't know if there's a number of mites that trigger the behavior or fail to trigger the behavior. I really think it's worker specific in whether or not they sense the presence of that mite and feel the urge, as it were, to get that mite off the bee or off themselves.

Amy 38:58
Alright. Okay, so for our third question, I'm excited to see how you answer this one. What is the best way to find a job in beekeeping? I think there are different ways that we could take this. Yeah, definitely. When I had asked you that question, it was specific to beekeeping, but that doesn't even cover the entire industry and any jobs related to honey bees in general, right? I mean, there's so much out there, Jamie. There's industry, there's research, there's, again, you said it, there's academia, there's what we're doing, doing extension stuff, doing outreach. There are nonprofit organizations out there. So I just feel like there are so many opportunities to get involved in the beekeeping world in general.

Jamie 42:24
Amy, those are all really good points. I agree completely.

Amy 42:26
All right, everybody. Thank you so much for your questions. Do not forget to send us an email. We really enjoy receiving emails. I cannot emphasize this enough. We love getting your emails. We love interacting with you all. Don't forget to send us an email or message us on one of our social media pages. Thanks for listening to today's episode. This episode was edited and produced by our podcast coordinator, Mitra Hamzavi. Thanks, Mitra.

Jamie 43:00
Visit the UF/IFAS Honey Bee Research and Extension Laboratory's website, UFhoneybee.com, for additional information and resources for today's episode. Email any questions that you want answered on air to honeybee@ifas.ufl.edu. You can also submit questions to us on X, Instagram, or Facebook @UFhoneybeelab. Don't forget to follow us while you're visiting our social media sites. Thank you for listening to Two Bees in a Podcast.