

## What Honey Bees Can Teach Us About Shaping Social Change

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<<Dr. Leo Taylor>>Okay. Hello and welcome to the College of Food, Agricultural, and Environmental Sciences 2022 Diversity, Equity, and Inclusion seminar series. My name is Dr. Leo Taylor and I serve as the program manager for faculty and staff affairs in CFAES and I want to thank you so much for joining us today for our first speaker in the series. I hope you will join us throughout the year as we have an incredible lineup of speakers including today's, and events take place on the third Thursdays of select months throughout the year.

In a little bit, I'll place a link to the series as well as some other resources in chat, but first a couple of logistics. Because this is a webinar, participants will not be visible on camera. However, chat is enabled, and you are welcome to utilize it throughout the session to react to the, contribute your thoughts, questions, and interact with other participants. I will serve as the chat moderator and will convey questions to the speaker as needed during the, uh, during the session but also at the Q & A period at the end of their presentation. By the way, live transcript has been enabled for those of you who have gained your deafness. Today's session will be recorded and posted to CFAES DEI YouTube channel, and if you have any issues or concerns during the presentation, don't hesitate to direct message me. Also, if you prefer to ask an anonymous question, please feel free to use the Q & A feature or, again, you can DM and it will be shared on your behalf. And, by the way, I want to point out we have a new certificate program. It's available to anyone, but it's a collaboration with, uh, the Multicultural Center and I want to point out that today's session qualifies as one credit towards a certificate. You can use this QR code to learn more, or you can go to [go.osu.edu/cfaesdice](https://go.osu.edu/cfaesdice). I hope that you'll check that out. {Clears Throat}

So, on to today's speaker. It is my great pleasure to introduce Ang Roell. I first encountered Ang through a webinar they delivered for Groundswells Farming for Justice webinar series and followed the trail of breadcrumbs to their Ted Talk about this topic and I could not wait to connect with them to set up something to, uh, to or at CFAES. So, Ang is a beekeeper consultant and founder of They Keep Bees which is an LGBTQ+-run apiary co-located in western Massachusetts and south Florida and there they raise queen bees and produce hive products. As a consultant, Ang is committed to helping clients make the changes necessary to shift organizational culture and practice from a model of dominant power to a model of cooperative power inspired by the ecological world. Ang holds a Master of Science and social justice education for Boston University and their book called *Radicalized Hive* is available to download for free online. I will put that link in chat in a while. You can also find information about their research on queen rearing also available online and they are a seasoned public speaker and educator. To learn more about Ang, please visit their website [theykeepbees.com](https://theykeepbees.com)

Um, so, without further ado, I want to pass it over to Ang. Thank you so much for being here Ang.

<<Ang Roell>> Thank you, Leo. Hey everyone! Um, I am going to share my screen. I just, uh, recently got an iPad to do presentations and it's very dramatic. It does like a countdown before it

lets me share things. [laughter] Um, okay. So again, thank you so much for having me. It's a pleasure to be here with y'all today, um, and I was really, uh, excited to learn about your work. And it's so cool that, um, folks can get certificate credits for attending this lecture series. Looks like a great series so hopefully people take, uh, take that and run with it. Um, so, my name is Ang Roell as Leo said. I'm a non-binary beekeeper and consultant. I live in so-called western Massachusetts which is Nitmock-Cometuck uh, and I also work in Florida which is where I am now. [clears throat]

My apiary is co-located in the two locations and I spend about five months out of the year down here in central and southern Florida working with bees and doing field work. So that's where I am now. I just finished my first full beekeeping week of the season, uh, yesterday, so it started last Wednesday and went through yesterday, um, and it was robust, and I am-I am in recovery from a car accident and part of that is that I have been recovering from a concussion so, uh, if I miss a word or take a minute to find one it is because, um, I am very tired. [laughter] But like I said, I run this little business called They Keep Bees where we work at the nexus of social change and social insects. We raise what's called adaptive queen bees and we produce honey, wax and educational resources for beekeepers. Our practice utilizes responsive and natural methods of beekeeping that are easily adaptable for small-scale beekeepers, so our objective um, is really to take some of the things we're doing at professional agricultural scale and teach them to beekeepers who are wanting small-scale operations or backyards so that they're able to continue to be successful and sustainable beekeepers. Um, I'm also a consultant. I work independently as well as with a team and do workplace culture consulting. And a lot of the work that I do, um, pulls in um, elements of emergent strategy and, uh, the ecological world. A lot from the hives, but also the ecology around us because as we'll talk about today, uh, bees are not just, uh, they don't exist in a vacuum. They exist in an ecology, um, and everything in that ecology from the mycelium to the trees to the water impacts the health of the bees in that ecology.

All right so, uh, this is me, um, I haven't always been a beekeeper. I was once a very small baby. [laughs] Um, I grew up in New York City, um, I was a working class, uh, and I grew up, um, very close to this little park and spent a lot of time there with my grandma who's in this picture all the way to my-the right on the screen. Um, yeah and I-I always put her in my presentations because she is just-was just a big, uh, patient caregiver. For me it's important to honor ancestors in my opinion, um, and in the middle, here is an image of me, uh, with some, uh, like a very tiny swarm of bees. There is a queen bee on my shoulder there, um, and that is why all of those bees are crawling all over me and not stinging me. They're excited about the newly mated queen that landed on me. Um, and then all the way to the left of the screen here is a queen bee. So this-these are the bees that I work with. Queens hold all the genetic material of a honeybee hive. So, we think about a honey bee hive, um, each one has about 30 000 bees in it, um, and the queen is the only one that can lay eggs which means she's the only one that can, uh, propagate and like disperse the genetic material of that hive most of the time. A lot of things with bees always have a caveat. With They Keep Bees, I work with a couple of different people. Very lucky to work with some excellent mentors. One of them, Kirk Webster up in Vermont, another my pal, uh, Sam Comfort down here in Florida, and up in New York and my partner B Cline who you see in the red shirt here.

Uh, this is one of my bee mentors, Sam Comfort. Um, we also do a lot of collaboration with our pal who's in the lower left-hand side of the screen here, Hannah, who works at the University of

Massachusetts. Um, and a big part of what we do is that we raise queens in these two bioregions right? And, um, what that means is that we are working with genetic markers that help queens be successful in Florida and we're working with genetic markers that help bees be successful in the northeast. We move bees back and forth between those two areas but we're not, um, we're not moving hives. Removing these tiny boxes that hold a queen and a small amount of bees so we can propagate from the bees we already have in each location and so that means that we live part of the time in the van that you see here and we also use it to move bees between the two locations.

This is, and this is, uh, my primary yard in western Massachusetts where I live. Um, we raise bees who are adapted to northern climates up there, uh, and we have a small piece of land it's about 15 acres where our primary yard is and then we work all the way up into the state of Vermont from western Mass. This is an amazing beautiful summer day, uh, where queens are actually mating and bees are returning to their hives. Uh, and then this is a picture of one of our yards in central Florida. This is in a town called Vero Beach, uh, where we raise queens. And you may have noticed from looking at these images that these hives don't look like your standard white box hive. Uh, that's because our business is really challenging the parameters of beekeeping. We use something called a comfort hive. Um, it's a smaller hive and we run something called nucleus hives or colonies, uh, and from those we catch queens which we sell to other beekeepers. Again, queens look like this and we're going to talk more about queens but I just want to give you a little background of like who I am and how I come to this work. Uh, I think it's quite different than people who are more traditionally academic, uh, because my work is rooted in like praxis, uh, like I am actually practicing being with and working with these and helping them propagate, uh, successful hives in these two bioregions, um, and what that comes with is just a tremendous amount of observation, right? I am in observation mode, um, 24 7 when I'm, uh, during my field work period which is basically from February until October, um, and that means that I'm doing research and documentation. But it also is just a natural observation of both inside the hive with what's going on in the hive so we can make informed decisions and externally outside of the hive, the weather, um, the nectar flows and the patterns of when things flower and when things fruit are all really important for me to understand, and to be able to see the patterns and have the capacity for pattern recognition and see where success in the hive relates to patterns of weather and nectar room outside of the hive is a really important part of what I do, uh, and it also means that I'm sort of constantly looking for patterns and like my awareness is heightened around ecological patterns and the connections between what I'm seeing in the ecology and what's happening inside the hive which means when I talk about, uh, honeybees and what they can teach us about shaping social change it's really coming from this practice of being with bees, uh, every day.

So, these hives that we keep, they're a little bit different. Um, they don't have the sort of wooden frames or the white box style, um, they have what's called top bars it's that long stick that I'm holding in this picture, um, and from that the bees draw their really beautiful honeycomb, um, and what's called brood comb. That's the center of their brood nest. That comb that you see in this image is the foundation for all life inside of the hive, and that wax comes from a lipid secretion. That bees secrete when they're very-very young. Um, it is a fat that they secrete that they chew into first circles and then hexagons because it's the most efficient shape to cover a surface area and on that they raise their young and then they store their food. So a lot of us, when we think about honeybees, think about honey because it's in the name, um, but actually, um, honey is what honeybees make, right? What they eat is nectar that they collect from the

ecology around them, um, and also pollen that they collect from the ecology around them and they mix those things together to make a fermented food called bee bread, uh, and that is really important to raising young and also dealing with nutritional balance. Bees communicate and know each other in a hive because they share a microbiome, um, so their gut flora is the same across every single bee in the hive, uh, because they have mixed this very specific gut flora into, um, every food that they're sharing inside of the hive and that's how they tell whether it belongs there or belongs in a different hive.

Slo, this wax is the foundation of all of that and nothing, um, can exist without it and I-I find myself in the last couple of years being really pulled to wax the process of rendering it down but also a deeper historical understanding of how humans use wax and how integral beeswax in particular was, um, to our early development of things like waterproofing and food preservation.

This is the inside of a comfort hive, um so these be these boxes, or these hives, are made with what's called rough cut lumber. And what that does is it allows for propolis build up on the inside of the hive. What's propolis? It's another key component of a hive. It is a sticky and resinous substance that is usually collected from the resins of trees mixed with that microbiome of the honeybee and then re-secreted in the hive to create a sterile environment in the space, because if you look at this, what you see is comb. You see top bars. You see a lot of nectar in those top cones there and nectar can very easily ferment if it's left in a dark place unless that dark place is kept, um, at an even and dry temperature, and so the use of propolis to coat the inside of the hive, um, it creates a barrier of protection around the space and then the bees use their wings to move air through the space and are thus able to, um, keep the space dry while the nectar cures. And that's how honeybees make honey that we think of traditional that comes in a jar. Um, they then seal it over with some wax, they store it, and they draw upon it when there's times of dearth or contraction. And I just wanted to highlight like two things that are really important for all hives are periods of expansion and periods of contraction.

This is looking, like, down into that same box, uh, and you'll notice again that there aren't frames. They are just these sticks. They are bamboo skewers that we cut to fit inside this box and the bees draw their own comb from these, um, and they create their own spaces between each of these lines, right? So, if you're looking at these you can see that two bees can pass in between these frames and the bees made that space it's called bees space, uh, in a more traditional or Langstroth-style hive. Those spaces are made by the humans. In this hive we're more responsive to the bees need and the shapes that they need to draw in order to thrive inside of these spaces these hives are also square which is a more efficient way to, um, to thermal regulate the internal space, um, and so these hives are designed to be like the cavity of a tree, uh, within-within reason and workable reason for moving around, um, so they are still a box, but they are designed to be square and if you think about the center of this being the internal cavity of a tree, um, that is where bees would be drying their nest down. And, again, the nest is made of this beeswax, as well as nectar and pollen and then brood which is young bees.

Okay, so the next thing that I want to talk, um, about is pretty much one of the most important things I want to talk about. Um, I-I think a lot about the lessons that we have to learn from honeybees, um, when I'm out in the field, and one of the most exemplary, sort of, spaces to learn that lesson or opportunities to learn that lesson, uh, is in the swarm. So, what you see

here is the branch of a mango tree, um, and on that mango tree there is a cluster of honeybees. I'm going to hit play and they're going to just move back and forth. Oh! And I guess I'm going to sweep them into a box, uh, and as I'm sweeping them, what I'm trying to do here is actually catch the queen because this entire cluster or swarm of bees is doing something called bio backing which is pausing, and honey bees have a lot to teach us about pause and the importance of that space.

Uh, Bio bio vacuum is the process by which the bees pause long enough to find a new home, um, and swarms are this really unique moment in a hive's development. So, every hive as I said earlier is made up of a queen bee, uh, and each queen lays eggs, and then she's laying eggs in that wax. Eggs become brewed, um, and as the bees grow and expand through the springtime they are going to be slowly getting larger and larger. More bees are going to be emerging from the brood, uh, more food is going to be coming in out from the outside of the hive, uh, and it's going to get very full of nectar, and in a natural system or in a small box system like what we do, that is going to increase, um, the hive's desire to swarm or reproduce. Swarms are a reproductive urge of the honey beehive they want to split in half and when they do that the old queen leaves the hive and she goes off with about half of the bees in the hive and she leaves behind this really well resource time that has lots of nectar, lots of pollen, and lots of young bees so that they can take those resources, produce a new queen, and then be able to thrive in that location. The other thing that the queen and those bees do is they leave and they travel at least two miles from the original home hive location, and they do that so that they don't create natural competition between the home hive and the new, um, the new hive. If there was a lack of resources or a dearth, they wouldn't be, um, taking the resources from their young or like taking- they're trying to leave behind a legacy of resource and not a legacy of competition which is I think an excellent lesson for the human race to learn from honeybees. Um, the other reason that I defend swarms so fascinating is because they are, um, they are this opportunity for communication that has to be incredibly coordinated in order for this cluster of bees, this bio vac of bees with a queen to fly off and find a new location. So, they don't just start looking for a new location once they get onto this tree limb. They've-there's several forager bees in the hive, they're called scout bees, and they're responsible for going out into the ecology and looking for good locations for a hive to set up a new home, and they're doing this along with their other duties so they might be collecting food, um, they might be collecting water, they might be collecting propolis as I mentioned earlier, um, and they might be collecting little bits of mud or mycelium which hives use for different, uh, thermoregulation purposes. Right? So, they have their job of going out and getting the things that the hive needs but they also have a secondary job of keeping an eye out for spaces that might make a good home. That secondary job they're doing by as they're foraging in trees looking for spaces, um, that may be a good place for a hive to be, so they'll go into a hole if they find that that space, um, opens up once they go through the hole they'll sort of explore it and they'll actually measure it with their bodies so that they can bring back to their sister bees, um, the idea of this new location. Not, [sigh] uh, not so that-not in the same way that like you have an idea and you're trying to sell it to another person or get them on board with your idea but more in an information sharing way. This is a location, it's two miles away it's, um, you know 100 liters of space, it's this tall, it's this wide, it's dry, and the entrance faces south. Right? And, we'll do that for several different locations. And there's also additional scout bees who are doing that and this is happening as they're collecting, um, food and the hive is getting bigger slowly, and expanding, and then once the hive decides "It's too

crowded in here. We've gotta do something about this." They start raising a new queen that old queen leaves these scout bees spring into action with all of this information that they've collected over the course of several of their trips. And they are like "okay, we are -we've got some options, we've got this location, it's south of us. we've got this location, it's west of us, we've got this location, it's east of us. Here are the specs for those locations. And in this cluster, they are dancing the information out to tell their sister bees what the possibilities are for where they could go, uh, and the bee whose location is chosen is chosen because it meets the specifications that are epigenetically, um, built into honeybee consciousness. Like they are looking for a place that's dry, that is a certain size, certain number of liters, uh, they're looking for a place that doesn't have a north-facing entrance usually because that tends to be quite windy, um, they're looking for a place that's high off the ground so they really are, um, naturally interested in the arbors or the trees, uh, because it lowers their pest pressure if they're up high, and it increases their opportunity to forage throughout the day because their hive is getting heated up and warmed up throughout the day, um, sooner when they're high up, closer to the sun.

And, so, the scout bees dance out these different locations and they dance and dance and dance and dance while they're sitting in this bivouac and as their sister bees evaluate the information that they're sharing, they begin to also dance with them, and this is an indicator that they have agreed that that particular location west of us is actually the best location. Once all of these bees have danced in agreement and reached a state of consensus, they alight into the air, and they use their eyes. So, they have a compound eye, and then they also have a three-part eye on top of their heads. Um, they use their eyes to watch the direction that the scout bees fly and they follow those scout bees to the new location. In any one of these swarms, um, I think Tom Seely has shared this, that there's-there's anywhere from like six to 50, um, scout bees. So, imagine that, like, this is probably about 15 to 20,000 small worker bees and one queen bee, and then less than a percent of them actually know where they're going, but they all alight into the air and watch those scout bees and follow them to the new location where they can make home. And, when they leave, all they're carrying with them is just a little bit of nectar and some pollen. Uh, the nectar gets carried in their stomach and the pollen on their legs. And, so, when they get to their new location they have to very quickly coordinate and organize who's going to build wax, who's going to get food, who's going to get mycelium, who's getting a propolis, who's going to get water so that we can build this hive out and begin to thrive here. And they're very motivated to do that, uh, because they need to do it to survive. Right? They're going out, they're setting up a new space, um, and in order to be successful and be able to expand in that space, um, they really do a) rely on each other and b) rely on an enormous amount of communication and coordination to make this happen. Um, so yeah. I always like to start with sort of a story of, uh, myself to ground us in the conversation, and then moving to sharing on the swarm because it's so fascinating. There's an incredible amount of depth to what we understand about this swarm thanks to a researcher out of Cornell named Dr Tom Seely. He's done a lot of swarm, um, tracking and research to understand the different communication methods that take place in the swarm and he's written several books about it; one called wild bees and another called honey bee democracy.

So, I like to tell this story of a swarm because I think that it highlights some things that we can learn from bees as humans. Um, there is this incredible amount of communication that's

necessary in order to be successful at collaboration. Right? And for us, as humans, um, we don't, we're-we're not the same genetic makeup obviously as bees. I like to say we're not bees. Right? It's pretty obvious. Um, they are more of a super organism. So it's more-when you think about honeybee hive you're thinking more about how your body and the cells within it communicate and share information to help you thrive, um, so there's-they're a super organism, meaning all of these individual parts work together, um, for the good of the whole, and that's important for them to be successful, uh, that's often important for our bodies moving through space to be successful. Right? We have to coordinate between our nervous system and our different, uh, co-regulation systems to co-regulate, um, and be able to move through the world however we do that. But humans, one to one or once, uh, put into groups, have different needs. Uh, we have sometimes competing needs. Uh, we have different capacities for communication. We have different experiences which often lead to different traumas that we're carrying with us that impact how we communicate, um, and it can be really challenging for us to communicate effectively or even to understand each other. So, I just feel like it's important to share the deep inspiration that I draw from honeybee hive and, also, just to honor that we're not bees. There is- there is no magic solution that I can offer you or similar bullet solution, um, from honeybees. It's just a series of lessons that are important for us to take, um, and consider in how we interact with each other.

Okay. [inaudible] I'm gonna skip a couple of these slides. So, when we talk about, um, what we can learn from these to be more effective communicators, I think it's important to talk about a couple of different things. First of all that communication is iterative and it is also, um, necessary for it to exist in, like, multiple modalities for people to be understood. Right? Bees don't have concepts of, um, inclusion. Like, they are a unit operating cohesively. And for humans, again, we have different needs. We often have different desires, different outcomes, and, so, it's important for us to, um, to be able to communicate effectively so that we can figure out how a group is going to thrive through periods of expansion, and periods of contraction. And, what it looks like to thrive through periods of expansion and periods of contraction look very different for each group, and it-it isn't necessarily the same, um, during periods of expansion and periods of contraction, um, and I think that that's a great model for honeybees. Right? In-in a huge hive that is ready to swarm, that is wildly abundant like the one that you see on the left, um, their needs are going to be different so what they take from the ecosystem around them, um, what they're bringing into the hive, what actions they're taking, are going to be deeply influenced by the period of abundance and how they can draw in the resources that they're going to need during that period of abundance. Uh, take a hive that has just come through winter and is very, very small or has just recently been established in a box like this hive that we see on the right, and their needs are going to be significantly different because they are in this state of contraction. They might have different nutritional needs. They might have different communication needs. And, so, this is just a great example of an opportunity for us to, uh, practice communicating what our needs are in these different periods and not to assume that our relationship is going to maintain our, uh, communication channel is going to maintain through all different periods of somebody's life. Um, somebody who we are collaborating with who's going through a really difficult time is going to have very different needs than someone we're collaborating with is experiencing an incredible amount of success and abundance.

I want to take it back, um, on this slide to queen. So, this is a tiny little, uh, virgin queen who is hatching from a clean cell. Queens hatch from these slightly larger brood cells that you see me holding here. They're naturally made by bees but humans can make them using a very specific

process called grafting and we put them in these tiny, uh, cups. And, when queens emerge from the cell they're actually quite fragile, um, their exocellus is soft and tender, um, and it takes them several hours to, like, harden off their exoskeleton. Uh, as I said before, every hive can only have one queen and that is important because what you see here is two.

Um, so, what happens when a queen is, um, or multiple queens have emerged inside of a beehive as they started something called piping, it's like an alarm or a-an alarm call that they're calling to each other and they'll actually battle each other, um, so that one emerges successful and is the, um, becomes the leader of that particular hive. Um, so. I share this for a couple of different reasons.

One, I think it's important to consider, like, what our needs are when we're first emerging into a space. Consider what our, like, hearts need, and how that's going to relate to our collaborations and, two, um, I just want to point out that there are lessons inside of a beehive that we don't need to bring into our human collaborations, and this one, um, a competition for who gets to lead, doesn't work in a human space. Right? And I just think it's important to own that too, uh, important to name that there are lessons on collaboration inside of a hive, and there's very real competition, um, inside of a hive as well. So, with, humans also don't exist in the vacuum and competition does exist in the natural world. But my question to you is "what can you learn from that about how you don't want to show up in collaborative spaces" uh, and so okay, so this is a natural system where, um, a leader is decided by fight, but how could a system look different if multiple people were leading and we trusted in the expertise of multiple people. And there's actually, uh-uh, in the queen rearing or breeding world, um, there is a way that you can select for a hive to let multiple, um, queens exist simultaneously. It's a genetic marker that allows hives to get incredibly robust very, very quickly because both of those queens are laying eggs and they basically create a hive that's so big that they don't ever, um, interact with each other. Uh, and those, that is, you know, it's again a genetic marker that comes up in queens that you have to select for, um, but there are many beekeeping operations that do select for that because it creates this really robust system that is incredibly abundant. So even though it's not the norm, it's incredible to think about what's possible, uh, when challenging that norm.

Just a couple of quick pictures and videos of queen bees that I wanted to pop in here. Um, queens are important to the hives' reproduction and so they're very well cared for by the rest of the hive. You see in that short video that a lot of bees are sort of following just a little behind the queen, uh, and they are caring for and nurturing her so that all she needs to focus on is, uh, taking care of the eggs in the hive and laying more of them. [sniff]

And, again, this is one of the ways that we propagate queens. We raise them in these hives. Um, we use multiple at a time and we take them out before they hatch so that they don't create natural competition with each other, um, and each of these little cells that I'm holding will go into a hive with no queen and create a new queen-rightHive when she's hatched and properly mated.

Um, I want to shift to talking a little about this work and why it's important-why it's important in the-in the scope of sustainability, uh, diversity, um, and the diversity of ecology. So, uh, there are different genetic markers that mean a hive can be successful um, and what's called hygienic in the different parts of um, the world. And unfortunately, what's happened in the beekeeping space is that we have lost some of that because of over breeding um, and really selective bottleneck reading that's happened in the beekeeping industry. Uh, and I write about this in my



book radicalize the hive um, and talk about why that has happened, what the history of beekeeping in the United States is, how that's connected to colonialism as well as, um, agriculture monocropping and sort of non-sustainable and non-generative systems. Uh, and when I got into beekeeping, I was really looking at the way that I could, um, I could challenge that system. I could push back against it and I could move beekeeping as an industry towards something that is more sustainable. Uh, I'm not the only one doing this work. As I mentioned there are a lot of incredible collaborators that I have, um, there's also mentors, uh, and researchers who are really motivated, uh, by this particular set of principles and have been working on the um, propagation of these that can be successful in different bioregions uh, and we're doing that because it's important for climate solutions. It's important for, um, the security of our food systems locally and regionally and with the way that, uh, honeybees are used as a tool for pollination now, um, actually means that they're moved around the United States a lot, um, and often not in conditions that are particularly comfortable for them. So, when we move bees, we move them, um, on screened bottom so these boxes have a screen underneath, um, and we move them in a refrigerated or like a cooled space. So basically it's like when they're driving they're going through one very long night to get from one location to the other. Uh, very often when beekeepers are moving bees for the pollination circuit, they are moving them on, uh, flatbed trucks. All of the hives are open they just have a huge net over them the temperature is changing very drastically from one place to another and a lot of bees are leaving the hive and basically dying in transit. Uh, then they get to where they're going. They're placed down in monocrop spaces like the almonds out in California, um, and citrus here in Florida, and very often those are grows that need to spray to maintain the production um, value of their fruits or nuts, um, and the bees are used as a tool for pollination while also having to compete with the realities of all of the pesticides that are being used in that space. So, when I got into beekeeping I really wanted to be in a space where I was not doing that work of migratory pollination and that I was working with these who were adapted to the different bioregions in which I was, um, and I was able to find an incredible network of folks who also do that work, um, across the United States and be able to learn from several different folks over about a decade of, uh, studying how to propagate queens and how to support these that do well in these different bioregions.

This is something called a queen marine calendar. This is basically how we make queens. Uh, queens come from an egg so any egg in a hive that a queen lays could be a queen bee if it's fed a very specific diet. Um, and it takes about 38 days for the egg to turn into a queen who's fully mated, um, so that egg gets fed a very specific diet, a diet of royal jelly and pollen that are mixed together so that she develops that very long back end that we saw in the previous images. Um, she hatches. She comes out of the cell which we already saw and then she goes on mating flights. So, she doesn't mate inside the hive. She actually flies out two to five miles away from the hive and she mates with drones or male bees in the air. She does that for about one to two weeks. She's trying to collect as much, um, genetic material or semen as she can, um, and she is only going to go on that flight one time-one period in her life. Right? So, she sort of got this opportunity to collect as much genetic material as she can and then she will use that to lay eggs for the duration of her life inside of the hive.

These are just some examples of the very large comfort hives. So these hives have to in order to get through winter up in the northeast have to be quite large they have to either be four or five boxes tall because they need that much space to store honey because that period of contraction from, uh, the fall until the early spring in the northeast, um, is a period where the only food that

the bees have is the food they were able to collect over the previous spring, summer, and fall. Right?

So, this picture that you see all the way on the right is an image of one of the frames that came out of the, um, tall boxes that you see on the left and [clears throat] this is just a really beautiful example of a central brood nest and what's called a honey cap, or that, uh, honey is all at the top of the frame. And that means that it is stored above the hive for both insulation and food for the winter. When honeybees go into a state of contraction, uh, they go into something called a cluster. They're not-the queen isn't laying quite as many eggs. She takes a break from doing that for the wintertime, um, and the hive works to keep her and each other warm by vibrating to generate heat. Um, and then the bees on the outside of the cluster are fanning to move that heat around so that the hive is equitably warm across the entire, um, area of that cluster and they move through the hives, through those-those boxes and they eat up the honey that's in the honey cap above them, um, and they have-able to draw on that essentially carbohydrate, uh, for the duration of the winter so that they can successfully come out of that period of contraction and into spring, a period again of expansion, uh, where they're going to collect nectar and pollen from the ecology around them and begin to make young once again. Again, we see in this, um, contraction that collaboration changes. Right? We talked about what it looks like in a swarm for bees to be in a state of expansion and have to have an incredible amount of trust and communication to travel, uh, but then they have to go into a period of contraction and be able to draw in, um, store their resources well, and keep each other warm and safe in the space that they're in so that they can get through that period and into the spring.

Oh, and I wanted to just show you the tiny little, um, eggs and larva. So these, every-all of the little cells that you see on the screen, uh, these are brood cells, and if you look down into the cells you'll see different stages or ages of the very young larval brood. At the bottom of this image are the eggs that look like tiny grains of rice sticking straight up out of the cell, and then they hatch and are fed royal jelly, and they sit in the pool of that royal jelly, and they eat it up. Nurse bees come and add more royal jelly to those and they get larger and larger. And, if you trace your eyes from the bottom of this image up to the top, you'll actually see that those larva are growing as they go up because the queen tends to lay in these patterns where the young-the youngest, uh, are in one cluster and then the second youngest are just above them and these get older and older as they go to the center of the cluster.

Um, and one of the ways that our business is starting to expand ourselves and, um, swarm, is to share the skills that we've cultivated over the last decade with beginning a new beekeepers, and to do this in a way that challenges the paradigm of beekeeping now which is white, cis, male agricultural men mostly from rural areas who typically have generational wealth, typically have the capacity to, um, to keep these, the capacity in the relationships to keep bees in multiple places in a particular region or territory, um, and are very protective of the-the skills that it takes to be able to do that in a sustainable way. If you know how to raise your own queens, to propagate your hives, to take, um, to sort of take the opportunity that swarms create and make more multiple hives, then you as a beekeeper are not reliant on purchasing bees from other beekeepers or purchasing them from other bioregions, and you're able to propagate the bees, um, and the hives that are successful where you are. And, because selling bees is big business because of pollination circuits and, um, and the quote-unquote save the bees movement, uh, beekeepers are very protective of this information about how to be a sustainable beekeeper raise your own queens be able to propagate genetics where you are, uh, that are going to be

successful in your ecology. Uh, and we're just really turning that protective, um, gatekeeping on its head and teaching beekeepers how to do the different skills that are necessary, uh, for propagating hives in your area. Uh, and one of those is called grafting which you see here. This is one of our students who has successfully grafted a larva and is examining it under a lens to, a magnifying lens, um, so he can get more information about that larva. Oops! Oh dear!

This is another one of our students who is grafting. So, she's taking a larva and actually placing it into a cell cup. Cell cups look like this. This is what we graphed into and we are propagating queens and we typically do anywhere from 100 to 250 of these, but we're teaching beekeepers to do this at all scales from one to two queens all the way up to the scale at which we do it. And those queen cells go into this hive. It's massive. Right? Um, immediately you see all the bees sort of spilling and dripping, uh, from this hive. This is something called a cell razor, uh, and cell raisers are queenless hives that you put these little larva into, and the bees raise them all up into, um, queen cells which then each of those can be separated out and put into its own, um, hive and made into a new hive potentially. A lot of things can go wrong in grafting like all things agriculture, but the objective is to take each of these beautiful queen cells, um, and make them into a hive that has a new queen. And we do that by taking a large robust hive which you see here and splitting it into a much smaller hive. And then we come back several weeks later we're able to catch those queens and split those hives again into more hives. And for us, we sell those queens to other beekeepers. We use them to make hives that we give away or hives that we host in different locations, um, and so we're constantly able to use this expansion to create an opportunity for new hives. That work. We've been collecting a lot of data about how we do that work and the ways that are most successful for us and we make all of that research available for free. We have an incredible grantor through Sustainable Agriculture Research and Education, uh, it's called Northeast SARE, which is a subsidiary of the USDA, um, and is a partner of the University of Vermont. And they have supported us in collecting data about how to breed the best queens for two different bioregions using the resources that you have available to you. And through that funding, we have been able to create, um, the guide that you see here called A How-to Guide to Sustainable Queen Rearing. We've been able to create comparison, uh, pamphlets about our different queen rearing methods, and we've been able to create a recipe for making splits from your hives even if you don't know how to, um, graft. And so, we are creating a more successful, uh, accessible, um, environment where beekeepers can be successful at taking this on as they build up their knowledge, uh, and understanding of bees and queens and those periods of, uh, expansion and contraction that happen naturally inside the hives.

My next big goal, uh, would be to create, um, an online community where we can also continue to hold and host this information and have opportunity for questions and answers and deeper dives into the content about queen rearing, but also the content about building a different and new kind of beekeeping, and what humans have to learn from honeybee hives in our individual communities, um, because I think all of those conversations are relevant and I see patterns where they're all deeply connected in my brain and I want to be talking about those patterns with other people in my world.

Um. Yeah. So I just, I wanted to wrap up by talking a little about this work and what it's becoming for us, um, because while we've been funded to do this work for the last two years, uh, we are now transitioning to a really exciting moment where we're going to be teaching this work, um, to new and intermediate beekeepers so that they can take it back into their apiaries

and try it, um, and begin to build that network of beekeepers that have these skills and can take them to where they are and teach them to other people, um, so that beekeeping can become—there can be a larger movement of small-scale beekeepers who are collaborating at a local level with local food producers, um, and really creating a more localized food system, uh, that is secure and has the capacity to, um, pollinate itself. Has the bees necessary to pollinate where they are. Um, and so we've taken this research and we folded it into something called gender generative bee school, um, which has already started. It is a series, uh, first online that brings speakers who are producing queens and rearing queens using alternative methods from all over the US and Canada, and those speakers are sharing their work, um, their philosophy, and also their stories because for us, I think we've identified that story is as important as the research data and information. Like we are, in order to hold space for multiple stories, it's important to us, um, to create space for multiple stories. Right? Uh, so, we want to bring in beekeepers that are challenging the norms pushing the boundaries and coming at it with their own unique story.

This is some of our research and I will link you to a particular site on my website where you can actually download all of this for free in case you are a beekeeper or you know a beekeeper, um, because we really, uh, put a lot of love into this research and I just love to share the visual information, um, and these are the two studies that we've just recently published about the most effective ways to rear queens, um, and testing, uh, methods of selection that are more akin to how wild bees raise their own queens, um, so that we are staying more true to an alternative kind of style of beekeeping.

Um, and this is that website that I mentioned, and I will take you all there after I'm finished, uh, talking. I'm just dropping that into the chat so you can check it out, um, and I just wanted to highlight, like, this this particular body of work is such an incredible opportunity for us to be able to teach the skills that we have, but also to cultivate a culture of collaboration, um, and communication that isn't happening in the beekeeping world, and is built on what we learn from the hive. So how are we building a culture of beekeeping and how beekeeping relates to the larger world or the larger ecology? That is a collaborative that has clear communication, that is accessible, that welcomes folks in, and gives them the skills to go out into their own communities and teach what they learned to create more sustainable food systems and a more sustainable world. So, I'm really excited about queen school, um, and I try to sneak it into all of my talks because it's—it's not just about bees, but it is also about culture.

Okay, and I'm gonna pause here, um, and I know it's one o'clock, but I really want to just take a moment to close this out with something that I wrote recently. Um, that's probably one of my most up lessons from a honeybee hive. Um, I could write another whole book [laughs] about the lessons I've learned from the honeybee hive over time, uh, but this particular one I wanted to leave you with today, um, is all, um, a lesson that I taught. I took from propolis. So, what you see here, I mentioned that resin earlier and I'm going to bring it back now, what you see here is propolis that is scraped from the inside of the hive and some there's little bits of wax in here as well but this is largely resin used to coat the inside of the hive. This particular hive didn't make it through the winter up north and so I, um, took a tool and scraped this propolis into a little bucket. And we actually make something called propolis tincture from this that's used to mix with other medicinal plants and resins, um, and is used in herbal apothecaries.

So, in thinking about propolis, I'm going to read you what I wrote, um, and offer it to you as a closing lesson for us. Make medicine from your mistakes. Beekeeping has taught me so much about embracing my failures, taking the lessons, and rendering them down to make medicine

for the future. This is propolis I harvested from a hive that wasn't sealed properly. That means they spent many cold nights working overtime to stay warm because before they gave up on that futile effort. Here is the propolis scraped from a single hive that didn't make it through fall because I made a mistake. I didn't seal the bottom of the hive correctly. Um, I left them open and vulnerable to that failure. This resin represents resin from hundreds of trees, uh, in the northeast ecology, collected one single drop at a time in the pollen baskets of individual honeybees and brought back to the hive. Um, this, for me, becomes medicine for propolis tinctures that can help my community stay healthy.

So, I invite you to make medicine from your own mistakes. To learn, to grow, to change, to commit doing to doing better, and know that you're going to keep making mistakes. Hopefully not the same ones, but mistakes nonetheless, because that's how we learn, that's how we grow, and that's how we change, and I think I want to close with that because the lessons and descriptions I've given you of the hive are all about this incredible collaboration and really transparent communication. But we, as humans, we can't get to that. We can't get to either of those unless we're willing to try and fail and move forward and make mistakes and make atonements and be accountable to our own behaviors and our own actions. Um, so yeah, I wanted to invite you in with that as a closing and then I'm going to pause my screen share so that I can take some questions.

<Leo> Thanks, Ang, for that wonderful presentation. I know I learned some new things and I'm an entomologist and have learned quite a bit about bees. Thank you for that. It was very insightful and, by the way, I as you've been speaking, I've been dropping in links. So, I've got a link here to your book, your research, actually I ended up downloading, uh, so the book is-is actually a pdf in chat available for folks as well as the research document. And, yeah. So if anybody has a question, we've got a question in the Q and A. Feel free to be blunt.

"Is it practical or possible for a novice to start beekeeping in the southwest?"

<<Ang>> Ooh, yes. I got some great, uh, beekeeping mentors in the southwest. I don't know where you are, but in New Mexico there is a-a peer, and friend, and mentor named Melanie Kirby, um, and New Mexico has really excellent, um, beekeeping association and a really rigorous, um, like relationships with very rigorous, uh, researchers. Um, so that would be a good place to start. Um, Arizona also has pretty robust, uh, beekeeping. The challenge in the southwest is, um, that there's, oh this is like another whole talk, uh, Arizona yeah, um, the challenge is that the wild hives in the desert are very defensive, um, and so a lot of the beekeeping there is going to be around the lesson of, um, not propagating your own genetics because bees made in the air, um, the potential for bringing those defensive traits into backyard beekeeping is very high. Um, but in general it's easy to get started and it's a good place to raise bees though the dry derths are really difficult for bees to survive. It's not impossible. I mean we're doing it in the northeast where we have six months of winter and that's definitely a lot harder on their biome and their capacity to survive and thrive.

<Leo> Someone asked, "have you ever heard of bee sting therapy that helps restore mobility?"

<<Ang>> Yes, I actively practice bee sting therapy to, uh, restore my mobility. I have rheumatoid arthritis, um, it's like a chronic inflammatory arthritis and, um, I use bee stings, uh, on my different, um, points where I experience a lot of arthritis; on my wrists, on my knees, um, and in my lower back, and it's incredible for me. I think that like all alternative medicines, different-different modalities work for different people in different bodies. It's very intense, um,

and it's very, uh, uh, the way that it impacts your endocrine system is quite, uh, robust. So, I always advise people to talk to a naturopath before pursuing that and not to try to do it on your own. [laughs]

<Leo> Other questions for An-Ang? Oh, let's see. Somebody had their hand up, but they took it down. One of the things that I was thinking about as you were talking is, uh, the-the high degree of relatedness because of the reproductive system in...

<<Ang>> Uh huh.

<<Leo>> ...honeybees and how that promotes, um, cooperation...

<<Ang>> Uh huh.

<<Leo>> and how we might translate that to-to humans. Although, uh, you know we're not all highly related, but we have evolved altruism...

<<Ang>> Uh huh.

<<Leo>> ... as a way to, um, bring communities together.

<<Ang>> Uh huh.

<<Leo>> But I think what I'm saying is what it-it's really a rhetorical question. What is the motivation...

<<Ang>> Right.

<<Leo>> ... for humans to be collaborative? To that degree,

<<Ang>> Uh huh.

<<Leo>> I think we have to dig a little deeper.

[Ang] Yeah, I agree. I think we have to dig a little deeper. I think that we see it often in states of emergency or chaos, but it doesn't often translate to-it has-it does not have longevity in human, um, in the current culture that we live in, in a, you know, uh, post. I'm gonna say post-apocalyptic landscape but in a [laughing] in a late-stage capitalist state. You know, that system doesn't allow for collaboration to thrive. It thrives on our isolation. Right? So, it is not propagated for collaboration to thrive over long periods of time. Um, we do it in states of emergency because it's a state of emergency, you know? Post-natural disasters, early covid, are examples. Ideas of unity and collaboration were very cohesive, uh, but that's changed a lot when we've been asked to continue to, um, consider other people's health and well-being a-alongside our own needs, and that is something I think we have to dig deeper about. I also think that we have to dig deeper about developing relationships across difference. I mean that is something that I have always embraced as a human in the world. Um, It's not even a professional choice. It's really just that I want to stay curious about what other people's experiences, um, and how other people are relating to the world and notice patterns and opportunities for connection based on that, and not necessarily seek out people who are exactly like me, who look like me, who think like me, who are all radical leftist socialists. Like-like I want to be challenged in my worldview. I want to think, um, and-and learn from the people that I surround myself with. And I personally think that if we, as humans, were able to seize more on that and getting a little bit more

uncomfortable with, um, not knowing or understanding what other people's life experience was like, that we could learn a lot.

<<Leo>> This is reminding me of something you said that I thought was noteworthy, uh, about legacies.

<<Ang>> Um

<<Leo>> leaving a legacy. I think it was of resources rather than a legacy...

<<Ang>> Yep.

<<Leo>> ...of competition and I feel like that's-that's one way that speaks to me about, you know, why would I want to collaborate with people who are different from me?

<<Ang>> Huh

<<Leo>> What is the legacy that I want to leave?

<<Ang>> Yeah.

<<Leo>> There's another question. "Do you lose hives from mite build up? Do you extract honey without destroying combs?" So, two questions.

<<Ang>> No. Yeah, um, you know, this-this talk wasn't really about queen production, and I totally invite you to check out our website and some of those classes where we will get into varroa mites who are, um, a very intense parasite that, uh, feed on the fat bodies of honey bees and actually make them more susceptible to diseases. Um, so yeah varroa mites are a real problem in all aviaries. In ours as well. Um, and we manage them through a system of brood breaks which is how bees manage them in the wild using swarms, but we do it using splits, um, and re-cleaning with either those queen cells that I showed you or younger queen cells that actually allow for a period of breadlessness. Varroa reproduce inside of the root cells of bees and so they can propagate five to fifteen times faster than the actual brood of the honeybees. So every one bee that's emerging could also be emerging five to 10 to 15, um, mites, and so these opportunities for brood to break or for the-the queen to have a light and a period where she is not laying eggs creates opportunities for the hive to recover. And we implement those in a series very intentionally with, um, the goal of disrupting the mite, uh, the mite reproduction inside the hive. And that helps a lot, uh, with the management of, uh, mites. And then no. We don't harvest honey without, um, without. We use a crush and strain method so we actually have to cut those combs out, um, and crush them and strain them through a sieve in order to harvest them. We don't harvest a lot of honey for that reason. We often leave-up north we leave over 100 pounds on every hive to get them through the winter, um, and down in the south we don't harvest until after the winter is over. The winter is much more mild, obviously, but we leave all the honey that our hives produce in the fall down here on the hives, uh, and we start taking it now once they've made it through the winter and the new spring, early spring nectar is coming in. Um, so, we prefer not to take honey and feed back sugar. We actually leave those resources with our bees which means our honey sells for a higher price point. But it also means that we're respecting the needs of the hive and allowing them to propagate, um, and keep the resources that they need because they know what they need to get through winter better than we do.

<<Leo>> Another question. We have two minutes left so this will be the last question. Do you feel backyard beekeeping is good and important given that 95 percent of the bee colonies are commercial?"

<<Ang>> Yeah. I mean, that's, and I think I talked about this already, but I-a lot of my-my opinion is that beekeeping should be happening more in community in a similar way that we have community supported agriculture. We should have community supportive beekeeping. Um, I think that small-scale farms and small-scale beekeeping go hand-in-hand. Localized food production means we would need localized pollinators to, um, have those nodes of food production be successful, uh, and it also would mean that if as we approach times of increased climate chaos, we can rely on, um, nodes of food production in other bioregions, uh, to come into our bioregion and support us if and when we're having a failure or need support. Right? So, I talked about that short-term-short-term support. If we have nodes of different beekeepers raising adaptive bees and have that-have the skills they need to be successful wherever they are, um, they are going to have an abundance. And what's going to happen is they are then going to use that to share, um, in moments of altruism or when it's necessary, uh, and so it would create, uh, a more collaborative system of beekeeping rather than a competitive system of beekeeping where hives are moved around, um, and territory is very hard to come by, and people are very secretive about the skills necessary to be successful. So, um, yeah. I do think backyard beekeeping is a key part of that, but I think that people need the skills to succeed at that type of beekeeping, um, and not just left to their own devices to flounder [laughs] and piece things together from YouTube and the internet. [Laughs]

<<Leo>> Well, I want to thank you so much, Ang, for being here today and for this amazing presentation.

<<Ang>> Uh huh.

<<Leo>> If you have questions actually, uh, do you mind if people reach out to you?

<<Ang>> Yeah. Please. Uh, my email is [info@theykeepbees.com](mailto:info@theykeepbees.com), um, and my season has started so my email reply time is a little bit longer, three to five days usually, um, because I'm out in the field a lot at this time of year.

<<Leo>> I think you may have inspired me to start a hive actually [laughs] protecting you. right well thanks everyone for, uh, being here today. This recording will be available on YouTube. Give us about two weeks and feel free to share it widely. Thank you so much for coming. Have a great day!

<<Ang>> Yeah. Thanks for having me, Leo.