A Radical Shift In The Interface Between Research And Real World

Booooos from the back of the audience were directed to the young woman on the stage at the California Beekeepers Association Conference. Without the context, the message could easily have been misconstrued. After all, Katie Lee was part of a national data-collection project, the Bee Informed Partnership (BIP), and the Northern California bee breeders were known for being less than open to outsiders. In the conference hallway, a breeder had just fumed over one hapless suitor to the role of mentor: "That guy comes up here to show us how to keep bees." With a sweep of an arm toward a nearby group he said, "Right there you have 600 years of beekeeping experience. We don't need anyone to tell us how to do things."

Lee had announced to the audience that she is leaving BIP's California Tech Transfer Team to start another team in her native Minnesota. She had been working closely with those bee breeders, and their catcall was saying: "Don't go, don't go, we love you so."

What was happening was no less than a seismic shift in the relationship between research and beekeepers. "Researchers used to inform us about what they were doing, and now they are saying, 'What can we do for you?'" said Jackie Park-Burris who runs one of the large queen breeding operations. At this point it would be fair to say that neither is the tech team strictly researchers nor are the breeders strangers to scientific process: For example, Park-Burris dissected bees for tracheal mites for over ten years, and said, "We have zero now." But testing for the accumulation of insults on the bees has become too much for beekeepers to keep up with.

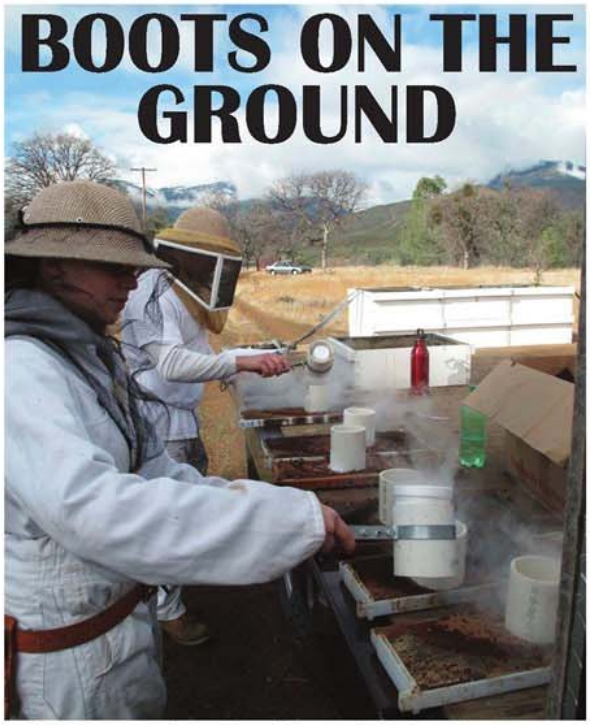
Dennis vanEngelsdorp describes the broader mission of BIP, "It is not a research project to collect data. We are doing what the beekeepers want – to learn what other beekeepers are doing but don't want to reveal their own. It is anonymous. We gather the information and we provide it. It's what they want rather than what researchers decide, but the two are not exclusive."

But how is it that three "kids", as some beekeepers call the tech team, have access – not only to apiaries but to guarded information? "Because of who they are and how they have conducted themselves, they have gotten access to some of the best bee breeders in the world. Before this, the beekeepers have kept things close to the vest; it's proprietary information," said Pat Heitkam, who is one of the participating breeders. The 16 were not chosen; they were simply those who stepped forward to participate.

Lee said, "We don't tell the beekeepers how to keep their bees. That's not what we are interested in doing. We are trying to make their process easier. They are total experts at what they do. We provide them with a pool of data on their own colonies and let them do what they want with it." The other ingredient is strict anonymity. Try and tease some information out of any one of the team and you will be convinced that they each keeps a cyanide capsule in their bee hat.

How did this team come about? The idea that genetics were key to strengthening the health of honey bees drove Marla Spivak's development of the Minnesota Hygienic line at the University of Minnesota. She knew that

BOOTS ON THE GROUND



Katie Lee and Rob Snyder of the BIP Tech Transfer Team pour liquid nitrogen to test for hygienic behavior for Northern California bee breeders. (Mike Andree photo)

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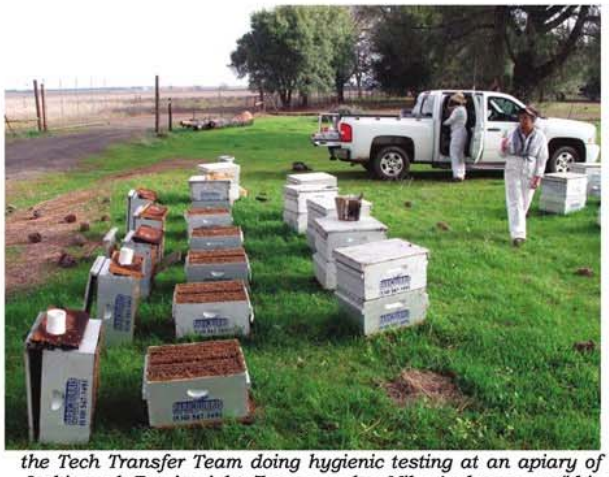
Northern California queen breeders produce most of the genetics disseminated across the country. Her proposal to them was to provide testing for *Varroa*, Nosema and hygienic behavior to support their breeder queen selection, starting in 2008. "In the beginning, we had already selected our breeders when we got Marla's results," said Park-Burris. "Marla came here with a goal, 'I have to get results to you before you select your breeders'. She did accomplish that goal. You can't give enough kudos to Marla for accomplishing this."

Meanwhile, researcher Dennis vanEngelsdorp came up with a sweeping vision: to bring diverse troves of bee data together with national surveys and assays to create an interactive online resource – all information for

The Bee Informed Partnership Tech Transfer Team, from left, Rob Snyder, Mike Andree and Katie Lee gratefully accept the gift of a truck, donated by Dan Cummings, an almond grower. Cummings will take care of major repairs as well. (BIP Tech Transfer Team)



the Tech Transfer Team doing hygienic testing at an apiary of Jackie park-Burris, right. Team member Mike Andree says: "this picture epitomizes the quality of beekeeping that is synonymous with the high quality of beekeeping in Northern CA. (Mike Andree photo)

the Tech Transfer team works with nucs at Heitkam's mating yard. Lee is in foreground and Pat Heitkam is in plaid shirt. (BIP Tech Transfer Team photo)

all beekeepers. He has funded his brainchild, the Bee Informed Partnership, with the largest extension grant ever given by the USDA, $5 million. Nine universities and the USDA are coordinating the gathering and analyzing of material – including the yearly APHIS National Honey Bee Disease Survey, the national Winter Loss Survey and the deep historical archives of the USDA. The philosophy of the project, to empower beekeepers to make their own informed decisions, fit what Spivak was already doing in Northern California.

Spivak had formally handed over the queen breeder project to Katie Lee, who, as her grad student, had created the 300-bee mite test that is now a standard. Lee had accompanied Spivak for the California work, which they did together for several years. When referred to as the head of the project, Lee laughed, "I was the only one here, so I was in charge of myself." Take charge she did, waking early, meeting a queen breeder every day somewhere in the region at his yard by 8:00 am or so, testing, taking samples among his apiaries and recording data for five to eight hours – one day for each beekeeper. Then, after the drive home, she'd work several hours more in her kitchen lab, the additional hour round trip to the UC Davis Extension lab eschewed in favor of sleep. "That was a little bit rough. It was a lot of work, and it was worth it," she said.

When the Tech Transfer Team became part of BIP, two new young teammates joined Lee – Rob Snyder and Mike Andree. Snyder had worked on a North Dakota longitudinal monitoring project and had been an apiary inspector. He and Andree had worked as field researchers with vanEngelsdorp in Pennsylvania. Andree likens his new experience to driving a vehicle built by those who created the grant: "It's been fun for the three of us to drive it around."

But it took some time to get up to speed: "Learning the dynamics of each of those operations was a challenge at first," said Andree. "A lot of them are family-run businesses, and these guys all know each other. So when you meet beekeepers there are also wives and children and sometimes their children's girlfriends – a whole big community of beekeepers rather than the 16 beekeepers that we are working with. You want to be scientific, you want to be consistent, and that goes for the way you process the samples to the way you deal with beekeepers in the field. Consistency is big in science.

Instead of analyzing all of the samples themselves, the team now does about 10% – to allow for quick preliminary results. "You find yourself on a weekend looking through the microscope counting Nosema or washing *Varroa*," said Snyder. "It's just something that you have to do to get this information back to them quickly."

Most testing for Nosema and *Varroa* is done at the USDA Beltsville lab. Andree blogged: "The BRL [bee research lab] Team has done an excellent job turning around samples, generating reports to the beekeepers, and getting them back to us to report." Timing, he said, is crucial for the information to be useful. Virus testing is done at Dave Tarpey's lab at the University of North Carolina to establish a base line. "It's still more than 40 hours a week, but it's a lot better. And I like being dedicated," said Lee.

Before they could begin to work together, the three realized that each had a separate idea of what was important for hive assessment, which they needed to do for every colony. Snyder described their consensus: on a one to five scale they rate frames of bees, weight of a colony, brood pattern, disease or pests, whether it is queenright. Fall, he acknowledges, is not the best time to judge temperament, so they assess that at other times. Color is also noted because it is important to some breeders. More qualities are added to later assessments. "What we are looking for are the outliers, colonies that are extreme – really heavy or light, black or yellow. When you pick breeders you want an exceptional hive," he said.

"We test four times the number of breeders they want. If it's 40 breeders, we will test 160 colonies that they have already selected," said Andree. In addition to *Varroa* and Nosema testing, they also do hygienic testing, returning to the apiary after 24 hours to read results. They are also doing separate studies of Pristine, a commonly used agricultural fungicide, and fumagillin, an antimicrobial treatment used by beekeepers.

A surprising finding has been similar levels of Nosema

in some fumagillin-treated and some untreated hives. Lee emphasized that they had just a snapshot from which they could not draw a conclusion. "This story is that there are other factors going on affecting Nosema levels in the colony that we don't know about yet. This is something that we really want to investigate, what the difference is with these beekeepers."

"We have tested a lot of colonies that we would call hygienic. We are finding a lot of potential here. This has been really exciting for us. Keep in mind that we have not been at this that long, and a lot of what I am talking about is preliminary," Lee said. "We don't want them to sacrifice any of their other traits. Some of these breeders have been selecting their line of bees for decades. The point is to help them breed that trait into their gene pool so that the daughter queens will be more hygienic and reduce the overall level of disease in the U.S."

The work has made a difference for breeder Brad Prancratz. He said at the CBA conference, "This project has really given me peace of mind. Now I have professionals coming in, giving me accurate results, telling me where I don't have Nosema and I don't have to treat, and it is saving me $80,000. Then they are telling me where I don't have *Varroa* and I don't have to treat. I used to come to these conferences and I would be thinking about what's going on, and I'm not there, and I can't do anything about it. Now I am here and I have peace of mind."

The goal of BIP, Andree said, "is to increase colony survivorship. If we can cut the top 25% of losses by half, we can save roughly 86,000 beehives. That would mean losses would drop from 34% to 19%." The project pursues that goal with national management surveys, field work to assay samples and longitudinal monitoring. You, the beekeeping reader, are asked to participate in the online management survey, providing data to be made anonymously accessible. More shareholders, as vanEngelsdorp refers to contributors, are needed to broaden the base of information. The website **www.beeinformed.org** gives simple instructions as well as the tech team's blogs and a wealth of information.

Apart from the many other samples that come into the USDA and become part of the data pool, the tech team is, at present, adding tests from only the 16 California bee breeders. "Lots of other beekeepers want to join. This is a model and we plan to get it in other parts of the country," said vanEngelsdorp, who was just coming out of the BIP national advisory board meeting that included researchers from five countries. "To do it stretches our budget so we need help."

Among the subjects discussed at the yearly meeting was the University of Illinois project to create a business plan to allow BIP to continue after its initial grant. The Tech Transfer Team in California is funded for five years, after which it will need to survive through fee for service.

Heitkam agrees: "It needs to be privatized." The process has already begun: When Lee leaves to start the new team to test migratory beekeepers in the Midwest, the Northern California beekeepers stepped forward to replace her. "Everyone at the meeting agreed that we are ready to put money out of our pockets to see this continue. That's how well accepted it is. It's amazing."

Geographic expansion of the program is needed, said Lee: "Just recently, Dennis vanEngelsdorp got a phone

Frank Pendell, center with yellow cap, and his crew afte a day in the bees with the Tech Transfer Team, the three to the right. (BIP Tech Transfer Team photo)

call from a beekeeper in North Dakota who desperately wanted someone to come out, but nobody could go. I would be there to see what was going on." She will be working with beekeepers who move bees in and out of the Midwest. "I still will be traveling quite a bit. Summer in the Dakotas looks like California in almonds sometimes, so many beekeepers are there."

Another potential location for a team is Hawaii, where Snyder and Andree's Penn State colleague Lauren Rusert is now an apiarist. Rusert and apiary specialist Danielle Downey visited the California tech team "to follow us around," according to Andree, to see if such a team could be created in Hawaii, where the *Varroa* mite has more recently been introduced. BIP is sending Lee to Hawaii to discuss the project with the predictable toss line "someone has to do it".

The California team will spread regionally as well. Andree said, "It's going to start here in the north state, and eventually we will be working with migratory beekeepers as well. The big thing is the breeder selection, that's the big thing."

Just as the project is expanding geographically, Snyder said that the protocol is evolving: "We are always looking for ideas from the beekeepers. One idea they gave us is to look at protein levels – natural pollen versus pollen patties going into and coming out of Winter."

The current longitudinal study in California involves 12 beekeepers of the 16, monitored three or four times a year. From that, a smaller group next year of about three beekeepers will have sampling and assessing from 200-300 beekeeper-chosen colonies after they requeen and before they treat. Summer reassessment will reduce them to the 100 best for more detailed evaluation. According to Andree, they will crunch numbers in December and winnow the group down to 50, which will be examined yet again with additional criteria.

These results will be available online at the Bee Informed Partnership website – anonymously, of course – with management practices and outcomes linked. A unified way of tracking, indexing and diagnosing field samples has already been completed in the database. The goal of going live with the interactive aspect of the site is about 70% finished, according to the BIP yearly progress

Rob Snyder and Katie lee sample bees at Strachan Apiaries, one of the 16 participants in the first phase of the tech team work. Lee is shaking bees into a simple device designed by Gary Reuter at the University of Minnesota called The Honey Bee Sample Thing – a piece of metal flashing the length of a frame and twice the width, folded to a 90° angle so that a frame of bees can be shaken into it and poured into a container. (Mike Andree photo)

report. Citing that the project has been funded for only a year, Jeff Pettis, who heads the USDA Beltsville lab, said, "I am amazed that they are as far along as they are."

BIP proposes to "Promote model best-management practices that are evidence-based" as well as "the training and inauguration of specialist apicultural crop-protection agent teams."

Heitkam sees the Tech Transfer Team as the start: "I have said that it could be industry changing. These people are incredibly talented and dedicated. They have so much enthusiasm. I see this as moving toward something like what they have in agriculture – crop advisors, technical advisors. It's about the bee industry maturing like other facets of agriculture have."

The team's old truck has been replaced by an almond grower. The jump seat in back was too small for any of them. "It was comical because none of us could sit back there, and we switched off cramming ourselves in," said Lee. "Dan Cummings donated a truck to the tech team. It is a personal gift from him. He also said that he would pay for any major work that needs to be done. It's super generous of him. It's a great truck."

When reminded that she was booed at the conference, Lee laughed. "I consider these beekeepers all to be friends of mine at this point. They have all been so supportive. I love working with them. These people are really interested in what they are doing. We are working to help them out, and I think they appreciate that. They lament the loss of any one who works out. For one, I remember it was the loss of a UPS driver who was reliable and took good care of the queens."

Park-Burris said of the team on the ground, "It's great having the kids here. It's stuff we can do, but we are so busy it is hard for us to follow through. They are better at tagging and following the hives and keeping the records. We get the results right away, so we can implement what we learn. I have considerably improved queen selection from the information. This is a vision Marla had, and now it is coming true for her with this project."

Pancratz said, "The tech team is a great asset for the industry. They come out to your outfit and do the work, and they work around my schedule. We've needed them for a long time."

"I'm real impressed with these young people," said Heitkam. "We have had a lot of stodgy old farts out here." BC

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