CSBA 2004 Annual Convention
Harveys, S. Lake Tahoe

Highway 50
Stateline, NV
(800) 455-4770
November 8-10, 2005

Monday, November 7

3:00 pm Board of Directors

Tuesday, November 8

8:00 am Registration and Commercial Exhibits Open
8:30 Opening Ceremonies and Committee Reports
10:00 Exhibitor's Break
10:20 Exhibitor Introduction and Door Prizes
10:30 "Two Queen System" – **Eric Olson**
11:15 "Bee Museum" – **John Scheuber**
11:45 "Private Applicator Certificate" – **Larry Lima**
12:00 pm Research Luncheon – **Nick Aliano**
2:00 American Honey Queen – **Sara Kornfield**
2:15 "Australian Bees" – **George Hansen**
3:00 Exhibitor's Break
3:15 Exhibitor Introduction and Door Prizes
3:30 "Fungus for Mite Control" – **Frank Eischen**
4:00 "CA Border Station Rules" – **Gary Leslie**
4:30 "Ag Commissioners' Report" – **Richard Price**
6:30 New Member and American Honey Queen Reception

Wednesday, November 9

8:30 Registration Continues, Exhibits Open
9:00 "American Honey Producers' Association" – **Steve Park**
9:15 "American Beekeeping Federation" **– TBA**
9:30 "Technology for Current Beekeeping" – **Jerry Bromenshenk**
10:00 Exhibitor's Break
10:20 Exhibitor Introduction and Door Prizes
10:30 "Cost to Put a Hive into Almonds" – **John Miller**
11:00 "CA Almond Board" – **Chris Heintz**
11:30 "Bee Brokers: How Easy Is It?" – **Broker Panel**
FREE AFTERNOON
12:30 pm **Virginia City Tour**
2:00 pm Sioux Honey Association Meeting

Thursday, November 10

8:30 am Registration Continues, Exhibits Open
9:00 "National Honey Board" – **Lee Heine**
9:30 "Farm Bill" - **TBA**
10:00 Exhibitor's Break
10:20 Exhibitor Introduction and Door Prizes
10:30 "Api-Life VAR" – **Steve Forrest**
11:00 "Feral Bee Colonies & Varroa Resistance" – **Adrian Wenner**
11:30 Ladies Auxiliary Meeting and Luncheon
11:30 "Hive Dwindling" – **Eric Mussen**
12:00 pm Lunch
3:30 Live Auction
6:30 Social Hour – No Host Bar and Silent Auction
7:30 Awards Banquet

Friday, November 11

8:00 am Breakfast Board of Director's Meeting

Congress on Social Insects

The 3rd European Congress on Social Insects (meeting of the European Sections of the International Union for the Study of Social Insects, Russian Language Section) took place in St. Petersburg, Russia, August 22-27, 2005. The keynote speaker at the first plenary section was Dr. Adrian M. Wenner, from the University of California, Santa Barbara. Through his participation, he was able to return to the U.S. with a copy of the Proceedings, which he shared with me and Dr. Robbin Thorp.

Actually, there aren't that many social insects, so most of the presentations were on bees, termites and ants. There were nine plenary lectures, 19 symposia and poster sessions. Most of those are abstracted in the Proceedings. I am going to follow the order of the Proceedings and share with you some of the interesting findings that were presented at the meeting. The Proceedings do not designate the working titles of the presenters, so there is no way to know who holds a doctorate, unless you know him or her.

Dr. Wenner's opening presentation presented the complexities involved in conducting experiments on pre-conditioning foragers to food sources. It is obvious that honey bees can and do use odors to a great extent when collecting nectar, pollens, or sugar syrup from a feeding station. But, the odors that they use to direct their flight may not be the odors that we introduced into the experimental system. However, since we are learning so much more about how honey bees use odor for orientation and finding food sources, we may be able to "train" bees to the target crop when they are being used for pollination of crops. Earlier attempts at training bees to a certain crop met with mixed results. Perhaps we can "get it right" before long.

Christoph Gruter et al. from Switzerland and Argentina trained bees to a feeder with odors in the syrups. Then they captured nurse bees, food processing bees, foragers and recruits and subjected them to the PER (proboscis extension response) test using the odors from the feeders. All ages of bees, in the colonies that had flavored syrup coming in, responded when the odor was blown across their antennae. Only a couple bees from control colonies responded to the stimulus. The authors state that "rapid distribution of food amongst hive members via trophallaxis leads to a fast propagation of olfactory information by means of associative learning, i.e. a large number of bees has been conditioned to a floral scent during food processing within the hive."

Mandyam Srinivasan et al. at the Australian National University reported on the ability of a honey bee to get a lot of use out of a very small brain. Instead of stereo vision, honey bees use "apparent speeds of motion" to determine how far away things are. They balance the images from both eyes to determine narrow gaps between objects and to be able to land on target. They have a visually-driven "odometer" that gages distance flown by sight, but with corrections for wind, body weight, energy expenditure, and landmarks. Additionally, bees learn to associate certain stimuli, like odors, to a full set of activities, like following a foraging trail back to a source of food when it becomes available after a period of absence. Besides demonstrating that big brains aren't essential for "perceptual capacity," the scientists are trying to mimic these computationally elegant solutions for machine vision and robot navigation – as in the recent $ 1 million "race" across the desert with driverless vehicles (won by Stanford University).

Jozef Simuth et al. in Slovakia and Germany have been studying polyphenism (different forms) of bees – workers and queens – starting from the same larvae and controlled by the diets fed to the larvae. Royal jelly was determined to have large spherical particles held together by apalbumin 1. This is one of the many proteins and peptides that are being associated with specific caste development in the honey bee. Two major groups of proteins are very similar to ovalbumin (storage egg-white protein) and serum albumin (major blood component). The proteins have specific roles in honey bee development: 1. enzymes that accelerate chemical processes, 2. nutritional proteins, 3. protective proteins and peptides directed toward pathogens, and 4. physiologically active proteins and peptides that produce immunostimulatory effects in the colony and influence processes in tissue cultures of animal cells. Detailed explanations of some of these activities are given and there is a comparison to some of the same or similar compounds that occur in fruit flies (*Drosophila*). They are comparing genetic sequences between the two insects, which recently have had their whole genomes sequenced.

Uli Muller in Germany studied the short-term and long-term memory formation in honey bees. It is known that hungry animals remember their training for long periods of time. These studies used well fed bees, to see if memory formation was different. It definitely was. Bees fed sugar 4 hours before the training session did not remember things long, at all. Without all the details, but for those who might wish to know, the sugar reduced the basal cAMP-dependent protein kinase (PKA) activity, and that affects both translation-dependent (early) and transcription-dependent (late) long term memory development.

Dorthea Eisenhardt and Nicola Stollhoff from Germany also studied memory in honey bees. They focused their studies on the proteins that are essential for memories to become fixed in the brain. This is a process called consolidation. They inhibited the translation process, mentioned above, and found that memory in bees has two consolidation processes involving an extinction memory and reconsolidation of the acquisition memory. Both of these processes have to be working properly for bees to bring up the memory. There are differences between these findings and those for vertebrates and invertebrates involving studies of aversive conditioning paradigms. That gives the researchers a lot more to study. Isn't it great that bees can learn and remember (us, too), despite all the chemistry involved?

A third study on honey bee memory by I.V. Ryzhova et al. in Russia was directed toward the role of glutamate receptors in memory development. Short-term memory was activated by injections of L-glutamate and L-aspartate, AMPA, and NMDA. Long-term memory was activated only by L-aspartate. That suggested that there are different types of glutamate receptors in the bee brain (cerebral ganglion). The rest of the studies concluded that the AMPA receptors are similar to mollusks, while the NMDA receptors are similar to those in mammals. Co-activation of AMPA and NMDA receptors are required for short-term memory. Some other system(s) is responsible for long-term memory and is age-dependent in honey bees.

Another paper on the brain, by Randolf Menzel and Paul Szyszka from Germany, explained their studies of the changes in brain tissues while learning took place. They did those studies by measuring the nerve impulses from a single nerve cell in the mushroom body of the bee brain. They stated that insects are extremely good test organisms because you can relate how the measurements in the lab correspond to the behaviors of the bees.

Recently, Dr. Zachary Huang joined a group of researchers who demonstrated that chemical communication between foragers and younger, non-foraging honey bees determined when the younger bees would become foragers. Charles Whitfield, Gene Robinson and others studied the changes at the level of the brain. They found that certain gene expression was involved with age, behavior, genotype, environment (colony), stress and treatment. The brain was involved with three different components of gene expression: development of behavioral competency (8 days old), current behavioral state (nurse or forager), and experience. Thus, the researchers are closer to determining the molecular correlates of natural behavior.

H. Michael G. Lattorff et al. from Germany and S. Africa delved into the mechanism by which certain bees, especially the cape honey bee (Apis mellifera capensis) can have so many laying workers that lay diploid eggs. This phenomenon is called thelytoky. It now appears that a honey bee homozygous for the thelytoky gene (th/th) produces such brood. Genetically, this is called a selfish gene, because the worker is pumping out clone-like brood of its own. But, it goes beyond that. The peculiar workers also pump out queen pheromone and tend to take over colonies. So, the genetic makeup also makes the bee act like a parasite. Thus, the gene that prevents normal meiosis also controls selfish behavior in parasitic workers.

Christina M. Grozinger, at North Carolina State University, observed the effects of queen mandibular pheromone (QMP or queen substance) on young and older worker bees. The effects were different. QMP keeps the ovaries from developing in young workers and slows down their progression to foragers. Once they are foraging, QMP stimulates foraging behavior. Thus, responses to pheromones are not static and "responses can by modulated depending on the state of the animal."

By now, you should be able to surmise that there is a ton of "molecular" work being done on honey bees. Jozef Simuth et al. point out that honey bees are a model for studying neurobiology, resistance to pathogens, innate immunity, allergic reactions, development, mental health, longevity, phenotypic plasticity (different caste of females), and how royal jelly and its components function in caste determination. Although the current studies do not appear to have an immediate application, there is potential for using the information for our purposes when the details are worked out better and when we can determine how to administer the precursors that will lead to the results we desire.

Just a quick note from the studies of K.A.. Aronstein and E. Saldivar out of the USDA Beneficial Insects Lab in Weslaco, Texas. Teasing the honey bee apart genetically shows that it shares 51.4% the same code for a receptor involved in activation of anti-microbial peptides as the silkworm and 46.6% and 42.5% the same code as *Drosophila* for two other receptors. This is similar to the Toll and interleukin receptors in mammals.

Guy Bloch in Israel looked into the biological clock of honey bees. Using a 12 hour dark/12 hour light and a constant light regime, he found that honey bees have a molecular system similar to mammals, not fruit flies. Under alternating day/night schedules, chemical changes were very evident. However, under the same regime, there were no similar chemical changes in nurse-aged bees. There were no changes in the dark for either age group. This ability to have systems turned off or on is called plasticity and is receiving a lot of attention these days.

Alexander Komissar of Ukraine noted some very interesting correlations based on the races of bees and their natural homes. Original races of honey bees usually were restricted for some geological reasons. Long standing groups of people also were defined by geographical locations. But, it is stated that there is a mutual influence of social bees, main religions, and life of human nations. Italian and Carniolan bees are distributed in catholic countries; Macedonian bees in countries with orthodox religion; and dark forest bees are incompatible with Catholicism. Hybrid races are used in protestant countries. Only in Albania is there a single bee race that is naturally distributed in both Christian and Moslem countries. Where main religion and honey bee race don't properly correspond, there are problems among the people in the near-border regions. The logical conclusion is that "the introduction of foreign bee races to regions with inappropriate religion can not be successful."

Andrew B. Barron and Richard Maleszka of Australia and Gene Robinson of the University of Illinois combined to test the effects of octopamine and serotonin on honey bee dance behavior. They studies five aspects of the distance and direction dance: 1. likelihood of dancing; 2. number of circuits performed; 3. vigor of the dance; 4. duration of waggle phase; and 5. angle of dance to vertical.

Serotonin seemed to have no impacts on the dances, eaten or applied topically. Octopamine, however, did show dose-dependent effects on the vigor of the dance, suggesting that it might be involved in the perception or processing of a "reward" (for its foraging efforts).

Charles Claudianos et al. from Australia, England, and France examined the honey bee genome and found that it has about 10,000 protein coding genes. That is 3,000 less than Drosophila and 4,000 less than the average mosquito. So, what is missing? It appears to be a shortage of environmental/stress response molecules. Those molecules regulate hormonal, nutritional, and chemosensory processes. Honey bees seemed to have become more specialized in the areas of nutritional and reproductive strategies and complex social and "cognitive" behavior. The authors think that this lack of protective diversity may put honey bees at risk if there is significant environmental change [Ed. – Like Varroa and the viruses it vectors?].

Yaacov Lensky from Israel monitored the temperature inside and outside the hives in a Mediterranean-type subtropical climate. Individual bees could handle temperatures up to 113^{o}F, but a 30 minute exposure to 122^{o} killed them. As the bees became warmer, their body weight (moisture ?) went down and they did not drink as much water as they lost. However they did drink three to four times as much water when the temperature exceeded 113^{o}. Effects of reflecting solar radiation were also studied. An empty hive painted white heated up to 100^{o}F in September. At the same time, a hive painted silver heated to 122^{o}. With bees in the boxes, the brood nest areas had the same temperature, but more bees were carrying and fanning water in the silver hives and the brood areas and honey production were lower in the silver painted hives. In cooler weather, hives placed inside Infrared-Polyethylene covered enclosures had warmer non-brood nest temperatures – 18^{o} warmer during the day and 5^{o} warmer during the night. There was a really large difference in brood nest area, adult bee population and honey production in the "heated" hives. Whether or not this was due totally to the temperature difference is questionable to this editor. However, a similar effect was observed in hives painted black.

M. Kleinhenz et al. in Germany also studied temperature control by bees in the brood nest. They found that bees heating the brood nest crouch down over a capped cell until their thorax is in contact with the cap. If the bee was coaxed off the cap, the wax was three to six degrees Fahrenheit warmer than the area immediately adjacent to the cap. Warm honey bees also were observed in empty cells surrounded by capped cells. This provides an opportunity for the bee to transfer heat to six cells immediately surrounding it. (Wasps do this, also.) In this experiment resting bees in the brood nest had temperatures of 90-93^{o}F. Heating bees had temperatures of 97-104^{o}.

Julia Jones et al. in Australia conducted studies to determine how important it is for honey bees to be reared at "brood nest temperature." Brood nest temperature is usually held within three degrees of 94^{o}F. They determine two important points. Not all bees are equally good at maintaining temperature, so it is good that bees have lots of patrilines (mate with lots of drones). Short-term learning and memory abilities of adult worker bees are affected by temperature conditions while they are pupating. In contrast, long-term memory seems unaffected by rearing temperature.

Alexander Komissar of the Ukraine also studied the behavior of the winter cluster. He heated the hive from the top down and observed the movement of the cluster. The bees preferred to stay in the temperature zone between 59 and 97 degrees Fahrenheit. They moved around and the queen preferred to stay in areas warmer than 77^{o}F.

Misha Vorobyev and Natalie Hempel de Ibarra in Australia and England studied how well bees can see. It appears that they only see about 1/100 as well as we do. While, in theory, honey bees can see an object in each single ommatidium (six sided cell in the compound eye), actually the image has to cover seven or more ommatidia to be seen. Honey bees do a much better job of seeing objects with bright edges and dim centers than objects with dim edges and bright centers. Using various ovals, the researchers concluded that honey bees react only to stimuli whose borders they can resolve. Natalie and other researchers looked at recognition of flowers by honey bees. It turns out that from a distance, flowers look bright on the edges and dim in the center. When the bees get closer, it appears that they switch over to color recognition to select which blossom to visit.

Judith Reinhard et al. trained honey bees to feeders that had various odors and some with the odors associated with a color. Trained to a single feeder, the scent from that feeder blown into the hive would cause foraging at that feeder. Trained to two feeders with different odors, the bees would go to the right feeder when the odor of one of them was blown into the hive. Trained to three feeders with different odors, the bees needed matching colors to go to the right feeders after the odor was blown into the hive. Apparently, being trained to two aspects of the same reward made the ability to discriminate among three choices possible.

Ingemar Fries in Sweden has conducted studies on *Varroa* control for decades. His latest study involved 150 colonies that were left out in the fields with no *Varroa* mite control. Over a period of five years the colonies dwindled to five in number. On the sixth year, there were five swarms, so that ten colonies remain. The results suggest that left to their own devices, some sort of host-parasite adaptation has occurred, ensuring the survival of both host and parasite.

Peter Rosenkrantz of Germany also felt that there might be some honey bee colonies tolerant of *Varroa* somewhere. He place 150 colonies of "survivors" in an apiary. After severe mortality, he selected eight "Carnica" and seven "Gotland" (island) and moved them to a military base for closer observation. Colonies were checked for bees, brood and mites at three week intervals. The Carnica colonies started with 400 mite averages, the Gotland with 700. Although the Carnica bees had more brood, the Gotland bees ended up with adult populations around 16,550 bees, while the Carnica had about 10,500. During the year, one Gotland colony was lost to queen failure. By the end of the active season, all the Carnica colonies had succumbed to the mites. The mites peaked at about 9,000 in the Carnica colonies. The Gotland colonies, that peaked at about 6,500 mites, survived until the late winter, when they all collapsed. The researcher suggests that the Gotland bees should be studied for their ability to maintain reduced number of mites during the season.

Jozef J.M. van der Steen et al. from the Netherlands suggested that an integrated approach to Varroa mite control should be considered. In the Netherlands, currently, the Dutch beekeepers use drone comb removal in spring and early summer, a thymol and/or formic acid treatment in the summer, and oxalic acid in the early winter. They state that the range of available tools has to be widened.

Anatoly Anismov et al. in Russia are working with a naturally occurring antibiotic from a strain of the fungus *Streptomyces*. In laboratory trials, the fungal extract killed chalkbrood fungus growing in laboratory culture. In field trials, the extract was not able to terminate, quickly, an active outbreak of chalkbrood. Fed in sugar syrup, the antibiotic seemed to reduce the amount of chalkbrood by 75% in 43 days. However, the next year the amount of chalkbrood was reduced significantly, almost always being zero. The bees were not too inclined to drink the medicated syrup, so work will continue on getting the bees to take their medicine better.

Anatoly Anismov and S.I. Razumovsky attempted to control *Varroa* mites in bee hives with two commercial acaricides, dimethan and omite. Dimethan killed 69, 73, and 78% of the mites upon which it was dripped at 0.025, 0.05, and 0.1%, respectively. Omite killed 72, 75, and 79% using the same dilutions mentioned above. A chemical that they currently are using, etalon (bipin 0.1%), killed 87% of the mites. Honey bee mortality was negligible with all the acaricides. In hives, results were similar. Dimethan and omite were not quite as effective in knocking down mites as etalon, but all were very effective against the mites and safe for use around bees. No residue studies were conducted, so it is not known if the chemicals could be registered for *Varroa* control in beehives.

Katrina Bilikova et al. from Slovakia and Germany are studying antimicrobial peptides in honey bees. Often these peptides are released into the adult honey bee blood (hemolymph) hours after the insect has become infected by bacteria. Apidaecin, abaecin, and hymenoptaecin are a few of the known peptides. But, there also are protective peptides in brood food (worker and royal jelly). These peptides are supposed to protect the larvae from becoming infected. Peptides have been isolated that have activity against American foulbrood and against fungi (chalkbrood?). Additionally, the peptides also cause secretion of anti-tumor peptides in mice. Thus, they feel that these peptides, or some similar to them, will become very important in the future of medicine.

Nailya Ishmuratova et al. from Russia examined some non-honey bee properties of a major component of queen substance, 9-oxo-2E-decenoic acid. They determined that it has antibiotic properties; anti-inflammatory properties; is an accelerant of wound healing; modulates immune responses; and serves as an antidote for intoxication caused by fungicides and herbicides.

Vladimir Kiryushin from Ukraine compared the grooming behavior of various stocks of honey bees, as it pertained to removing *Varroa* mites. Polessian bees, the Middle-Russian bee, dropped a 10 mite average while the Carpathian bee dropped 8 mites. A local hybrid only dropped 3 mites during the same time frame. The Middle-Russian bees caused the most damage to the mites, while Ukrainian and local bees did not harm the mites. It appears that mite destruction, in addition to mite removal, is an important aspect of mite resistance.

Vladimir Radchenko and Irina Shumakova of Ukraine isolated emerging bees from contact with any older bees to determine if they learned how to build comb from being on the comb or interacting with other comb builders, or if the information was intuitive. Detailed video observations showed that individual bees worked alone and were able to build normal wax combs, never having contact with experienced bees.

Shiri Shnieor et al. from Israel compared pheromones of queens and worker bees. In queens, the Dufour’s gland (associated with the sting) is more developed than in workers. The product of that gland tends to be long chain esters from queens and long chained hydrocarbons form workers. Under queenless conditions, the workers’ ovaries developed. Some of these potential laying workers were ignored, but others attacked, when they were put into cages with other workers. It was determined that the workers with Dufour’s glands, that now secreted queen-like esters, were the bees most likely to be attacked. Placed back into a queen-right colony, the ovaries of the laying workers shrunk and the ester production dropped off.

Ieina Shumakova and A. Komissar of Ukraine studied the structure of honey bee comb cells that bees build to hold a comb against a vertical surface when they are induced to build comb where the combs can not be attached at the “top” of the nest. The cells turn out to be pentahedral and sometimes are used for brood rearing and food storage.

<u>Price of Queen Bees</u>

Beekeepers can be quite creative and analytical. The following information was generated by Frank Pendell, a queen breeder in northern California. He admits that the relation between the price of honey bee queens and almond pollination rental is purely coincidental, but it is intriguing.

Year	Price Queen	Price Rental	%

1993	$ 5.75	$ 30	19
1994	$ 6.00	$ 35	17
1995	$ 6.25	$ 35	17.8
1996	$ 6.50	$ 36	18.1
1997	$ 7.00	$ 36	19.4
1998	$ 7.00	$ 36	19.4
1999	$ 7.00	$ 36	19.4
2000	$ 7.00	$ 36	19.4
2001	$ 7.50	$ 40	18.75
2002	$ 8.00	$ 40	20
2003	$ 8.50	$ 45	18.8
2004	$ 10.50	$ 55	19
2005	$ 12.50	$ 80	15.6
2006	*$ 22.50*	*$ 125*	*18*
2007	*$ 27.00*	*$ 150*	*18*

Frank's data may have to be adjusted, according to the info passing over the grape vine. Prices for strong colonies of honey bees for next year's almond pollination are at $ 150.00, right now.

It also remains to be seen if beekeepers would be willing to pay over $20 for a commercially produced queen. However, this past season, the demand for queens never dropped off throughout the year. A number of queen breeders have decided to taper back on that part of the operation, hold back on bees that would have gone into packages, and bring the bees to almonds, where they can make the most money for their efforts.

Sincerely,

Eric Mussen
Entomology Extension
University of California
Davis, CA 95616
Phone: (530) 752-0472
FAX: (530) 754-7757
Email: ecmussen@ucdavis.edu
URL:entomology.ucdavis.edu/faculty/mussen.cfm

Eric Mussen
Entomology Department
University of California
Davis, CA 95616