CUNY Animal Behavior Initiative

The CUNY Animal Behavior Initiative (CABI)

2nd Annual Conference

Saturday, April 20 2013, 8:30am – 8:00pm

Hunter College

West Building, 3rd Floor

695 Park Ave, New York, NY

The conference will include three keynote speakers (including a public evening event), eight sessions of talks, and two poster sessions. We will serve breakfast, lunch, afternoon coffee, and evening refreshments. Registration is at no cost.

This conference is supported by funds from the CUNY Research Foundation and the Hunter College Provost

Conference Program

8:30am – 9:00am Sign-in and Breakfast

9:00am – 9:15am Welcome

9:30am – 10:30am Keynote Lecture I (Green Room): Jaak Panksepp (Washington State University):
The archaeology of mind: basic emotional feelings of the other mammals – do they exist and are they similar to our own?

10:30am – 10:50am Coffee Break

10:50am – 11:50am Breakout Sessions A and B

Breakout Session A (Green Room): Neuroendocrinology/Neuroethology I

10:50am – 11:10am Frank Grasso (Brooklyn College) - Continuous nest maintenance, sociability & an invasive parrot in Brooklyn

11:10am – 11:30am Caitlin Field* (Hunter College) - Differences in rate modulations and variability in active electrosensory behavior between genera of pulse-discharging weakly electric fishes

11:30am – 11:50am Saranna Belgrave* (Hunter College) - Effects of parity on anxiety and memory

Breakout Session B (Cafeteria): Sexual Selection

10:50am – 11:10am M. Aaron Owen* (Queens College) - Sexual dimorphism in the small Indian mongoose (*Herpestes auropunctatus*): implications for sexual selection

11:10am – 11:30am Tony Wilson (Brooklyn College) – Sexual selection and the evolution of the Major Histocompatibility Complex

11:30am – 11:50am Dawn Konkoly* (Fordham University) – The early birds are getting earlier: long-term shifts in dawn chorus onset

11:50am – 11:55 Session Break

11:55am – 12:55pm Breakout Sessions C and D

Breakout Session C (Green Room): Neuroendocrinology/Neuroethology II

11:55am – 12:15pm: Wan-Chun Liu (Rockefeller University) – Specialized forebrain vocal circuit for learned begging calls in a brood parasite

12:15pm – 12:35pm: Christopher Peterson* (Brooklyn College) - Exposure to courtship calls of other males elicits cFos response in catecholaminergic neurons in the plainfin midshipman fish

12:35pm – 12:55pm: Ian Hall (Columbia University) - The *Xenopus* amygdala mediates socially appropriate vocal communication signals

Breakout Session D (Cafeteria): Communication

11:55am – 12:15pm: James Higham (New York University) - What factors lead to the evolution of multicomponent and multimodal signals?

12:15pm – 12:35pm: Carla Almonte (Quinnipiac University and Southern Connecticut State University) - The vocal classification and communication of captive North American river otters (*Lontra canadensis*)

12:35pm – 12:55pm: Kerstin Musolf (University of Zurich) - Ultrasonic vocalizations as cryptic courtship signals in mice

12:55pm – 1:50pm Lunch and Undergraduate Poster Session

1:50pm – 2:50pm Keynote Lecture II (Green Room): Patricia Brennan (University of Massachusetts – Amherst): Sexual conflict and genital evolution: removing the 'gate' out of 'duckpenisgate'

2:50pm – 3:10pm Coffee Break

3:10pm – 4:10pm Breakout Sessions E and F

Breakout Session E (Green Room): Social Behavior I

3:10pm – 3:30pm: Christina Webb* (Columbia University) – Revisiting reconciliation: individual differences in conflict and post-conflict behavior in chimpanzees (*Pan troglodytes*)
3:30pm – 3:50pm: Karyn Collie* (Queens College) – Sibling egg cannibalism by neonates of the Colorado potato beetle
3:50pm – 4:10pm: David Lahti (Queens College) – Towards a macroevolutionary perspective on defenses against brood parasitism

Breakout Session F (Cafeteria): Learning/Cognition/Development I

3:10pm – 3:30pm: Adrian Rodriguez-Contreras (CCNY) - Maternal care regulates auditory development in Wistar rats
3:30pm – 3:50pm: Jenny Basil (Brooklyn College) - The role of convergence in the evolution and function of complex brains and behaviors
3:50pm – 4:10pm: Dina Lipkind (Hunter College) – Song imitation out of context: correcting local errors in a wrong syntax

4:10pm – 4:15pm: Session Break

4:15pm – 5:15pm: Breakout Sessions G and H

Breakout Session G (Green Room): Social Behavior II

4:15pm – 4:35pm: Kevin Purce* (CCNY) - Slave drivers: parasite control of host foraging behavior by slavemaking ants
4:35pm – 4:55pm: Greg Barord* (Brooklyn College) – Slow, stubborn, and sexy: the secret life of nautilus
4:55pm – 5:15pm: Steffen Foerster (Barnard College and Columbia University) – Food availability and social network structure in female blue and Sykes' monkeys (*Cercopithecus mitis*)

Breakout Session H (Cafeteria): Learning/Cognition/Development II

4:15pm – 4:35pm: Elena Cunningham (NYU College of Dentistry) - Ruffed lemur spatial knowledge
4:35pm – 4:55pm: Peter Moller (Hunter College) – Electric memories are made of these: scallops
4:55pm – 5:15pm: Kirill Tokarev (Hunter College) - Auditory representation of social meaning of communicative signals in the songbird brain

5:15pm – 6:45pm: Graduate Poster Session and Refreshments

6:45pm – 7:45pm: Public Keynote Lecture (Room 714HW): Stephen Pruett-Jones (University of Chicago): Monk parakeets in the United States: biology, behavior, impact, and public perception

7:45pm – 8:00pm: Award Announcements and Farewell

* indicates graduate student presenter

About the 2nd Annual CABI Conference

The CUNY Animal Behavior Initiative is an organization of researchers in animal behavior, evolution, ecology, and behavioral neuroscience within the CUNY consortium and in the surrounding community, who share interests in the behavioral and perceptual mechanisms of animals in the field and captivity. Our strength is in studying mechanisms of behavior in a variety of model and non-model systems from electric communication and maze learning in fish, to animal intelligence in dolphins and elephants. *The 2013 2nd Annual CABI Conference was organized by CUNY Graduate Students Rebecca Croston (Chair), Zachary Aidala, Andrew Fulmer, Zack Gharamani, Julia Hyland Bruno, Iva Ljubicic, Rachel Morrison, and M. Aaron Owen.*

Carla Almonte (Quinnipiac University and Southern Connecticut State University)

The vocal classification and communication of captive North American river otters (*Lontra canadensis*)

North American River Otters are semi-social animals with a distinctive set of vocalizations. The purpose and information content of these vocalizations is poorly known, and to date there is no quantitative analysis to associate any of these calls with particular behaviors. For this reason, I studied the vocalizations of 10 captive river otters (males: n=5; females: n=5) in 5 zoological facilities in the greater New York City area, with the aim to first, group the calls into distinctive sets with common characteristics, and second to make associations between the groups of calls and particular interactions among otters. I found that calls were difficult to group into types because of the large degree of individual variation within call types. Nonetheless, I defined 4 primary call types and 7 sub-types that make up the vocal repertoire. The repertoire is made up of a complex set of sounds, with some sounds being universal to all the repertoires. I also analyzed the behaviors that occurred when a vocal was produced and found that some call types were used in a specific manner, and exhibited during particular interactions.

Greg Barord (Brooklyn College)

Slow, stubborn, and sexy: the secret life of nautilus

The shell of the chambered nautilus was once described by Aristotle, has been used in cultural traditions in the Indo-Pacific, and now sits atop millions of shelves throughout the world as a collector's item. The shell story is important, but it is just half of the story. The shell protects an animal that has existed in the oceans for nearly 500 million years. However, its extreme habitat (down to 700 m) has hindered *in situ* behavioral research. Baited remote underwater video systems (BRUVS) have been deployed throughout the Indo-Pacific for conservation purposes and population assessments. The BRUVS also provide direct evidence of the behaviors of wild nautiluses. The observed behaviors can be grouped into three categories: (1) feeding, (2) defense, and (3) conspecific interactions. The recorded feeding behaviors suggest nautilus is a strict scavenger and does not feed on live prey items. Nautilus also appears to lack evasive actions in response to predators, relying on a secondary defense of retracting into its shell when attacked. Finally, while initially attracted to bait, Nautilus quickly abandons the bait to attempt to mate with conspecifics, whether male or female. The observed behaviors indicate that nautilus resides in a habitat with limited resources, predators, and mates. By combining the two stories, shell and animal behavior, researchers can design effective protocols to maximize the scope of their results. Future studies will provide further insight on the success of nautiloids on Earth, the evolutionary role of nautilus behavior, and future conservation initiatives to protect nautiluses.

Jennifer Basil (Brooklyn College)

The role of convergence in the evolution and function of complex brains and behaviors

Cephalopods are an ancient group of marine molluscs with complex brain organization and sophisticated behaviors. Predatory species of cephalopods, extinct and extant, compete(d) with marine vertebrates because they often occupy similar ecological niches. Convergent processes may thus be acting upon both groups and are largely unexplored. A major division among extant species falls between those retaining external shells (the slow, scavenging Nautiloids), considered ancestral, and those with reduced or absent shells (the fast, predatory Coleoids), a more recent modification. Brain complexity follows similar lines: the nautiloid brain is considered plesiomorphic, while coleoid brains are more derived. Evidence supports that the post-Devonian radiation of coleoids was driven, in part, by mutual competition between marine vertebrates and cephalopods. Recent advances in our understanding of Nautilus brains and behavior suggest that brain expansion coincident with the coleoid radiation may be built upon an ancient architecture that predates the advent of bony fishes, perhaps from prior competition with other cephalopods and marine forms. Indeed, the learning and memory capabilities of nautiluses share marked similarities with the coleoids in capacity, duration and flexibility. Coleoid brain complexity may thus have resulted from at least two phases of interspecifc competition, one before and one after the advent of bony fishes.

Saranna Belgrave (Hunter College)

Effects of parity on anxiety and memory

The experience of motherhood, pregnancy, birth and pup care, is associated with neural and behavioral changes. Multiple bouts of motherhood (multi-parity) have been shown to dampen the HPA axis stress response, induce better performance on spatial memory tasks and changes in hormone levels associated with memory and stress as compared to age matched females who have not given birth; some of these changes are maintained into old age. Thus, parous rats may

provide a unique, physiological model to investigate neural and hormonal factors contributing to a decrease in compromised function during aging. In the current study, we investigated whether parity influences performance on spatial and recognition memory tasks, anxiety, and oxytocin levels. Memory task performance was assessed using object recognition and object placement. Corticosterone levels and the Elevated Plus Maze (EPM) were used to assess anxiety levels. Oxytocin levels were assessed from blood serum. It is hypothesized that performance of the retired breeders on the memory tasks would be more similar to young virgin females than to age-matched virgin females, they would have increased oxytocin levels and decreased anxious behaviors. Multi-parous females performed significantly better in the spatial memory task compared to the other groups where $F(2,19)=5.7$, $p< .013$. No significant differences between groups in corticosterone levels, on EPM or in oxytocin levels were found; although oxytocin levels were high in all groups. Given the data from this experiment it would seem that parity does indeed have some positive ability to attenuate the effects of cognitive aging in females.

Karyn Collie (Queens College)

Sibling egg cannibalism by neonates of the Colorado potato beetle

Egg cannibalism reduces competition and provides nutritional benefits that are especially advantageous for young individuals, but pre-dispersive juveniles may cannibalize kin. Sibling egg cannibalism must therefore balance inclusive fitness losses, and cannibals may be selected to avoid killing relatives. Egg cannibalism may be a form of maternal care facilitated by females when their offspring face harsh conditions and may be used to reduce competition, increasing when competition is high. Neonates of the Colorado potato beetle, *Leptinotarsa decemlineata*, often consume eggs in their natal clutch, a combination of full and half siblings. Cannibalism in this species was studied to determine what fitness benefits neonates gain and whether these benefits outweigh inclusive fitness costs. Neonates were tested for their ability to discriminate between eggs based on relatedness, whether they reduce kin-selection costs by preferentially consuming inviable eggs, and whether egg development is used as a cue. Female mediation of cannibalism was examined by measuring the oviposition behavior of females provided either high- or low-quality plants. Cannibalism propensity of neonates from populations facing different levels of competition was also compared. Sibling cannibalism does increase growth rates and decreases development time, compensating for the costs of eating a half sibling. Neonates discriminate eggs from other populations but not within their own population, prefer eating inviable eggs, but do not use egg development as a cue. Females on low-quality plants can increase the number of inviable eggs available to hatchlings. Cannibalism is highest in populations with higher competition and changes with competition levels over time.

Elena Cunningham (NYU College of Dentistry)

Ruffed lemur spatial knowledge

Do black-and-white ruffed lemurs (*Varecia variegata*) remember the location of feeding trees? Although research has shown that monkeys and apes use memory to travel between feeding sites, little is known about lemur spatial cognition. *Varecia* is a highly frugivorous lemur that lives in seasonal environments. I collected GPS and behavioral data on four *Varecia* for nine months in Ranomafana National Park, Madagascar. If *Varecia* know the location of resources, they should travel to distant feeding sites more efficiently than expected. I analyzed travel paths to feeding sites that were more than 100 meters from start locations using two computer models: the Change Point Model which detects changes in direction and the Step Model which uses observed turning angles and step lengths to generate expected distances to predicted feeding sites. *Varecia* travel paths showed three distinct patterns across months: 1) they travelled along varied paths between feeding trees, 2) they spent most of their time in a central tree, and 3) they had long paths in which there were few feeding bouts. The results of the computer models support the hypothesis that *Varecia* remembered the location of important feeding sites and suggest that they may have considered the productivity of trees.

Caitlin Field (Hunter College)

Differences in rate modulations and variability in active electrosensory behavior between genera of pulse-discharging weakly electric fishes

Weakly electric fishes use their electric organ discharge (EOD) to explore their environment. As such, their EOD behavior can be used as an indicator of their attentive state. We examined active electrosensory behavior of four genera of pulse-discharging gymnotiforms: *Steatogenys*, *Hypopygus*, *Microsternarchus*, and *Brachyhypopomus*. Subjects were solitarily placed into a recording tank for 72 hours and allowed to freely explore. The inter-pulse interval (IPI) of their EOD was recorded continuously. All genera exhibited shorter IPIs (faster rates) at night than during the day, with night-time increases ranging from 16-73%, depending on the genus. These increases are associated with active exploration of the environment during the night, in contrast to the very quiescent daytime behavior. The variability of the discharge pattern was assessed on two scales: the standard deviation for an entire time period, and the pulse-to-pulse variability.

Steatogenys and *Hypopygus* both had larger ranges of rates during the day than at night, but *Microsternarchus* and *Brachyhypopomus* did not display such a difference. All genera also showed higher pulse-to-pulse variability at night. The electrical behaviors exhibited differed between genera: all genera produced frequency rises, most commonly at night, but *Steatogenys* also occasionally produced rapid frequency rises of just a few pulses, which we have termed chirplets. The types of modulations differed clearly between genera, in ways that suggest differences in the use of electroreception and the motor control of the EOD.

Steffen Foerster (Barnard College)

Food availability and social network structure in female blue and Sykes' monkeys (*Cercopithecus mitis*)

Like other aspects of animal behavior, the structure of social groups and the dynamics of social interactions therein may be adaptive traits that evolved to optimize fitness in response to ecological conditions. Among primates, food availability and distribution have long been seen as important selective factors in the evolution of social behavior, influencing, for example, the kind and magnitude of competition, which turn affects the benefits and costs of interactions within and between social groups. As studies have traditionally focused on dyadic interactions among pairs of individuals, the impact of ecological factors on the structure of social networks on a larger scale is still little understood. Here, we used data collected in three groups of African forest guenons (*Cercopithecus mitis*) to describe changes in grooming network structure of adult females in relation to the availability of fruits, the preferred and most contested food type. Using a social network analysis approach, we found that with decreasing fruit availability, individual females increased their number of grooming partners and distributed grooming more evenly across partners, leading to overall greater social integration as indicated by multiple network centrality measures. We explore the possible causes and adaptive value of this pattern in the ecological context of the study populations, and discuss potential implications of our findings for understanding primate socioecology.

Frank Grasso (Brooklyn)

Continuous nest maintenance, sociability & an invasive parrot in Brooklyn

Monk parakeets (*Myiopsitta monachus*) are an extremely gregarious species of parrot that have successfully invaded North America and Europe. They build large, free-standing, multi-chambered stick nests that are maintained year-round by social units larger than mated pairs. Behavioral studies in their native Argentina suggest they are cooperative breeders. Behavioral studies there also show year-round nest maintenance in urban and rural areas. While they are prolific in Florida and Spain, their success in Northern cities like Chicago and Brooklyn suggest urban micro-niches facilitate their ability to colonize these colder climates. Behavioral observations of their nest construction, usage and maintenance made on over 120 nests in Brooklyn over the last 11 years demonstrate that large social units (observed max=22) contribute to single chamber construction and larger groups contribute to single, multi-chamber nests (observed max=43). I suggest that the ability of monk parakeets to colonize northern urban settings results in part from their cooperative year-round nest construction behavior that makes the nest an important information-sharing center.

Ian Hall (Columbia University)

The *Xenopus* amygdala mediates socially appropriate vocal communication signals

Social interaction requires that relevant sensory information is collected, classified, and distributed to the motor areas that initiate an appropriate behavioral response. Vocal exchanges, in particular, depend on linking auditory processing to an appropriate motor expression. Because of its role in integrating sensory information for the purpose of action selection, the amygdala has been implicated in social behavior in many vertebrate species. Here, we show that two nuclei of the extended amygdala play essential roles in vocal communication in the African clawed-frog, *Xenopus laevis*. Evidence from tracing with fluorescent dextran amines identifies the *X. laevis* central amygdala (CeA) as a target for ascending auditory information from the central thalamic nucleus and as a major afferent to the vocal pattern generator of the hindbrain. In the isolated (*ex vivo*) brain, electrical stimulation of the CeA, or the neighboring bed nucleus of the stria terminalis (BNST), initiates bouts of fictive calling. *In vivo*, lesioning the CeA of males disrupts the production of appropriate vocal responses to females and broadcasts of female calls. Lesioning the BNST in males produces an overall decrease in calling behavior. Taken together these results suggest that the anuran CeA serves as a site of sensory integration that initiates socially appropriate vocal responses to female cues, while the BNST plays a broader role in the initiation of vocalizations.

James Higham (New York University)

What factors lead to the evolution of multicomponent and multimodal signals?

Much animal communication occurs using multiple signals, often expressed in multiple modalities. Despite a growing

number of empirical studies involving such complex communication, there has been less theoretical work on the advantages it confers. Here I ask: why should animals communicate with multiple signals? I tackle this question by considering game theoretic techniques, in particular highlighting models developed in the economic signaling literature that might offer insight into biological problems. I investigate signal honesty under two prevailing paradigms of honest communication - costly signaling and cheap talk. In both paradigms, without further constraint, it is straightforward to show that anything that can be achieved with multiple signals can be achieved with one, and that there are no fitness advantages to sending multiple signals. I present a range of constraints that when applied to these models make communication with multiple (including multimodal) signals strictly preferable, and hence more likely to evolve. These include constraints on cost functions and bandwidths, orthogonal noise structures across modalities, the use of strategically distinct signaling nodes, the communication of multiple qualities, and the presence of multiple signalers, and of multiple audiences. Such circumstances all provide biologically plausible scenarios that theoretically favor multiple signaling generally, and multimodal signaling specifically, and may lead to the evolution of complex communication.

Dawn Konkoly (Fordham University)

The early birds are getting earlier: long-term shifts in dawn chorus onset

Anthropogenic activities may alter the timing of events critical for reproduction and survival. Previous ecological research focused on the impacts of such anthropogenic activities on changes in phenology or seasonal patterns. However, anthropogenic activities, such as those increasing temperature, and ambient noise and light, may also alter diurnal rhythms. Just prior to sunrise, individuals of many avian species begin vocalizing; this period of synchronized vocalizations is called a dawn chorus. Birds commonly use dawn chorus vocalizations during mate selection and territory defense. To determine whether the onset of dawn chorus has shifted over time, I conducted an analysis dawn chorus onset using data extracted from primary literature spanning 110 years. I used a least squares linear regression on a species-independent scatter plot of average dawn chorus onset and year of observation. I found that species dawn chorus onset currently begins, on average, seven minutes earlier than in the 1900s. This average was not uniform across all species; while some species showed no shift in onset timing, onset in other species shifted by as much as 60 minutes. Previous studies have linked altered dawn chorus onset to delayed nesting, reduced clutch size, and increased energy expenditures for vocalizations. Given the link between reproductive fitness and dawn chorus onset, understanding shifts in dawn chorus onset is important as many populations of man avian species are in serious decline.

David Lahti (Queens College)

Towards a macroevolutionary perspective on defenses against brood parasitism

Bird species vary widely in the strategies they use to avoid or counteract brood parasitism, and in the extents to which these strategies are developed or refined. Can a particular strategy be predicted on the basis of a species' ecology or life history, or the intensity of brood parasitism? Or are there simply multiple equivalent ways to solve the same problem? The first step towards addressing such general questions is to assess the defensive traits of several species subject to brood parasitism, preferably closely related species. The African *Ploceus* weavers parasitized by the diederik cuckoo (*Chrysococcyx caprius*) are a case in point. The well-studied village weaver (*P. cucullatus*) is expert at egg recognition and rejection, facilitated by egg appearance variation. Recent work on two relatives, *P. galbula* and *P. intermedius*, show that the traits of the first appear to be on the same trajectory as the village weaver but at a less advanced stage, whereas the second employs an entirely different and more preventative strategy. Relating defenses to more basic species-specific traits may provide clues as to why these species differ in their defenses against brood parasitism, and may yield insights into trait evolution and diversification more generally.

Dina Lipkind (Hunter College)

Song imitation out of context: correcting local errors in a wrong syntax

Young songbirds learn a precise copy of the song of an adult. This requires the ability to match the acoustic structure of individual sounds in the correct order. It has been hypothesized that birds accomplish this feat by comparing the auditory feedback of their own performance to an auditory memory (template) of the target song. Little is known about the existence and properties of such a song-comparison mechanism. Here we present experimental evidence on how an internal template guides the development of the motor program for song. We presented young zebra finches with song learning tasks using playbacks of two different tutor songs. Birds were first trained with one song, and once it was learned, were introduced to a second song, in which we manipulated both the global structure (syllable order) and the local structure (pitch of individual syllables). We found that birds matched the pitch of syllables to the most acoustically similar target in the tutor song, regardless of global context, resulting in an intermediate-stage song in which the correct tutor syllables were sung in the wrong order. Our results refute a template matching mechanism where template syllables are

recalled according to temporal order, and suggest that instead, parts of the template are recalled in a motor driven way, according to their similarity to sung syllables. Therefore, two distinct mechanisms are required to accomplish song learning: 1. Local matching of acoustic structure, which is independent of global context (tuning); 2. Rearranging syllable order to match the target syntax (sequencing).

Wan-chun Liu (Rockefeller University)

Specialized forebrain vocal circuit for learned begging calls in a brood parasite

Vocal learning in songbirds requires a protracted vocal ontogeny and complex forebrain song circuit. The under-developed neural circuits and the simple acoustic structure of early vocalizations produced by young hatchings seem preclude the likelihood of early vocal learning. We hypothesize the selective pressure experienced in early postnatal life may lead to vocal learning plasticity and modify associated, pre-existing brain circuits. Here we found the production of food begging call by fledgling brown-headed cowbirds (*Molothrus ater*), a generalist brood parasite, induces the activation of several immediate early genes and early circuit innervation in a forebrain vocal-motor pathway that is later used for song learning. This forebrain neural activity is correlated with vocal intensity and learning plasticity of begging calls that match host young vocalizations. The specialized begging-induced forebrain circuits observed in cowbirds were not found in nonparasitic passerines, including both close and distant phylogenetic relatives of the cowbirds. The selective pressure on brood parasitic young to procure food from heterospecific host parents may have induced early vocal learning of begging calls and accelerated the development of a forebrain vocal circuit that is later used for song learning, which provides young cowbirds with a flexible signaling strategy that may facilitate a generalist brood parasitic lifestyle.

Peter Moller (Hunter College)

Electric memories are made of these: scallops

Weakly electric fish (*Gnathonemus petersii*) generate and perceive weak electric discharges (EODs) that serve in spatial navigation and social communication. Using their electric sense fish can learn an escape route in a spatial maze. During acquisition of the correct path, fish exhibit a characteristic EOD patterns dubbed 'scallops'. We hypothesize that the 'scallop' pattern is an external marker of internal neurochemical and physiological events associated with memory acquisition, consolidation and retention, and that 'scallops' serve as a rehearsal tool to improve maze performance. In fact, when fish were prevented from generating 'scallops' maze performance declined. Concurrently, we investigated the role of protein kinase M-zeta (PKM-ζ) during maze learning in these fish, focusing on the lateral portion of the teleost area dorsalis (DL), which is homologous to the mammalian hippocampus and has been implicated in spatial memory. Trained fish showed significant elevations in PKM-ζ and GluA2 expression in DL, but not in the medial pallium (as compared to untrained controls). Fish that were prevented from generating scallops did not show elevated PKM-ζ and GluA2 expression and showed decreased learning performance. Together, these findings suggest that scallop behavior is a unique external manifestation of internal cognitive and molecular mechanisms of memory. This project is a collaboration of Dr. Peter Serrano, Dr. Chris Braun and myself, and undergraduate and graduate students in our laboratories.

Kerstin Musolf (Universty of Zurich)

Ultrasonic vocalizations as cryptic courtship signals in mice

House mice emit a wide range of ultrasonic vocalizations (USVs, 30 - 110 kHz) beyond the range of human hearing. Studies with laboratory mice have shown that USVs are emitted by pups as distress calls, and also by adults, especially by males during courtship. Recently, it has been shown that the USVs of male mice have features of song (i.e., different syllables types repeated in phrases). The adaptive function of courtship USVs is unclear, and they have only recently been studied in wild house mice. We analyzed the USVs recorded from males and the responses of females to males' USVs in wild-derived house mice (F1 offspring of wild-*caught Mus musculus musculus*). Our results extend previous findings on laboratory strains to wild mice, and support the idea that male USVs function as courtship behaviour to attract mates. Finally, our results show that USVs are highly diverse among males, with some males appearing not to vocalize. The USVs produced by vocalizing individuals are used by females to distinguish between familiar versus unfamiliar individuals, suggesting that they may play a role in individual recognition, inbreeding avoidance and other forms of mate choice.

M. Aaron Owen (Queens College)

Sexual dimorphism in the small Indian mongoose (*Herpestes auropunctatus*): implications for sexual selection

Sexual dimorphism is often a hallmark of sexual selection. I investigated sexual dimorphism in several morphological traits in the invasive small Indian mongoose (*Herpestes auropunctatus*) in Hilo, Hawaii. Small Indian mongooses are solitary and nonterritorial, and they likely depend on chemical (scent) rather than visual or acoustic signals for communication.

Additionally, they possess a fleshy projection around their anus, the anal pad, thought to aid in scent marking. Overall, males were heavier, had longer bodies, tails, and total body lengths, larger skulls, larger anal pads, and wider canine teeth diameters than females. Furthermore, for a given total body length and for a given mass, anal pads were larger in males than in females suggesting a particular function for males. Unexpectedly, 88% of males had diseased anal glands, and both sexes exhibited significantly wider left bottom canine teeth than right bottom canine teeth. The results of this study indicate that both body and anal pad size are likely sexually selected traits in males; however, further research is needed to elucidate their functionality in both intrasexual competition and intersexual advertisement.

Christopher Petersen (Brooklyn College)
Exposure to courtship calls of other males elicits cFos response in catecholaminergic neurons in the plainfin midshipman fish
In many vertebrates, species-specific vocalizations are key components of male appetitive sexual behavior and are essential for mating in certain teleost fishes. Nesting males of the plainfin midshipman fish, *Porichthys notatus*, vocally court females by producing long duration (> 1 min) advertisement calls (hum). Females localize males by their hum, spawn once, and return offshore. As multiple courting males establish nests in close proximity to one another, the perception of another male's call may modulate individual calling behavior in competition for females. We tested the hypothesis that nesting males exposed to conspecific mate calls would show elevated neural activity in auditory and vocal-acoustic brain centers as well as differential activation of catecholaminergic neurons compared to males exposed to ambient noise. We subjected male midshipman to underwater playbacks of field recorded advertisement calls in an outdoor arena and labeled their brains by double immunofluorescence (-ir) for tyrosine hydroxylase, a marker for catecholaminergic neurons, and cFos, an immediate-early gene product used as a marker for neural activation. Males exposed to conspecific mate calls showed significantly greater numbers of TH-ir cells colocalized with cFos-ir in the noradrenergic locus coeruleus and the dopaminergic diencephalic periventricular posterior tuberculum, as well as increased numbers of cFos-ir neurons in several levels of the auditory/vocal-acoustic pathway compared to males exposed to ambient noise. These results implicate a role for specific catecholaminergic neuronal groups in auditory-driven social behavior in fishes, consistent with a conserved function in social acoustic behavior across vertebrates.

Kevin Purce (CCNY)
Slave drivers: parasite control of host foraging behavior by slavemaking ants
In parasite-host interactions, the host is a part of the extended phenotype of the parasite and thus behaves in such a way that increases the parasite's fitness, often to its own detriment. The obligate slavemaking ant *Protomognathus americanus* captures the brood of *Temnothorax spp*. on slave raids. The *Temnothorax* pupae then eclose in the parasite's nest and adopt the colony odor, perceiving the parasite as its kin. The host workers subsequently forage, care for the brood, and feed the parasite through trophallaxis. This study demonstrates that the parasite does not solely exploit the imprinting of the colony odor on its host, but also manipulates host foraging behavior, a risky activity for the host. Compared to nonparasitized colonies, parasitized colonies have a greater proportion of *Temnothorax* workers foraging for food, a shorter discovery time of food when it is available, and a greater proportion of total workers at a food source once it has been found. The behavioral change may be explained in part by the depletion of fat reserves in the host worker force by a disproportionate number of trophallactic events between the parasite and the host. In other words, the social stomach of parasitized colonies may be emptied out at a greater rate than that of nonparasitized colonies.

Adrian Rodriguez-Contreras (CCNY)
Maternal care regulates auditory development in Wistar rats
The onset of hearing in mammals and other vertebrates is characterized by the formation of an air-filled middle ear cavity in conjunction with rapid changes in auditory sensitivity and behavioral responses to sound. The mechanisms that control such coordinated developmental changes between the auditory periphery and the central nervous system are not well understood. In this study, we tested the hypothesis that changes in maternal care trigger a physiological response that regulates hearing onset in Wistar rat pups. We compared the effects of brief (15-minute) periods of maternal separation (MS) with the effects of cross-fostering (CF) pups at postnatal day (PND) 1, 5, and 9. We employed micro CT x-ray scans and auditory evoked potentials to measure anatomical and functional changes in the development of the auditory periphery. We found that MS and CF pups formed a middle ear cavity at earlier ages and had higher auditory sensitivity than naïve pups when manipulations were done at PND1 and PND5, but not at PND9. We did not find increased levels of the stress hormone corticosterone in MS and CF pups, and observed that in addition to the changes in auditory structure and function, experimental pups showed early eye opening and consistent weight gain over naïve subjects. These results provide evidence that maternal care regulates auditory development in Wistar rats during a sensitive period in early

postnatal development. Future work will determine what aspects of maternal and pup behavior change in this experimental context.

Kirill Tokarev (Hunter College)
Auditory representation of social meaning of communicative signals in the songbird brain
Zebra finches are a highly social, gregarious, species and eagerly engage in vocal communication. We studied how socially reinforced and aversive vocal stimuli influenced vocal learning and development of stimulus-specific auditory brain responses in zebra finches (using fMRI). In our experiments, juvenile male zebra finches learned to discriminate a song that was followed by a brief air puff and a song that allowed them to stay in visual contact with another bird. Surprisingly, both trained a passive listeners were equally likely to imitate either of the songs, irrespectively of its value. However, significantly larger areas were activated in the brain of trained birds in response to the socially reinforced song than to the aversive one. Auditory responses to unfamiliar conspecific song, on the other hand, tightly correlated with the scores of avoidance of the aversive song. Such stimulus-specific responses were absent in passive listeners. Our results suggest that social meaning associated with different songs in zebra finches may be encoded in the auditory responses detectable by fMRI.

Christine Webb (Columbia University)
Revisiting reconciliation: Individual differences in conflict and post-conflict behavior in chimpanzees (*Pan troglodytes*)
Stable individual differences in animal behavior have been the focus of a large and growing body of recent research. Such differences have been demonstrated in a variety of species, from invertebrates to primates, as well as across multiple behavioral domains, from exploratory to social tendencies. Reconciliation, or post-conflict affiliation between former opponents, is one behavioral domain in which individual differences have not been studied. A phenomenon documented in >30 primate species (and more recently in other social animals), variation in reconciliation occurrence has typically been explained at the species, group, or dyadic level. As such, this work has failed to emphasize individual differences as a potential source of variation in conciliatory tendency. The current research represents the first systematic study of individual variation in reconciliation behavior in nonhuman animals. An exceptionally large dataset of conflict and post-conflict interactions in two socially housed groups of chimpanzees (*Pan troglodytes*, N = 31) allowed us to establish that 1) there are individual differences in chimpanzee reconciliation, 2) these differences are stable over time, and 3) these differences relate to how socially active an individual is within its group. Multilevel mixed effects models tested for these patterns while controlling for a variety of factors regarding the individual (e.g. age, sex), its relationship to conflict opponents (e.g. kinship, dominance, affiliation), and the conflict itself (e.g. intensity). Although stable individual differences have long been overlooked, the present findings suggest that they are an important determinant of chimpanzee reconciliation and thus highlight new directions for future research.

Tony Wilson (Brooklyn College)
Sexual selection and the evolution of the Major Histocompatibility Complex
The Major Histocompatibility Complex (MHC) is an essential component of the vertebrate adaptive immune system, responsible for the recognition and presentation of foreign antigens. The genes of the MHC are exceptionally polymorphic, a condition thought to be mediated by a combination of pathogen-mediated selection and disassortative mating preferences. Recent simulation results indicate that natural and sexual selection may interact in a non-additive fashion, generating levels of MHC variation in excess of those expected under either process in isolation, and highlighting the potential importance of sexual selection in the maintenance of ecologically-relevant genetic variation. Sex-role reversed species, in which the conventional patterns of male competition and female choice are inverted, offer a potential opportunity to experimentally partition the forces of natural and sexual selection and to better understand their involvement in the generation and maintenance of genetic diversity. I will describe the recent characterization of the genes of the Major Histocompatibility II loci in the sex-role reversed seahorse, *Hippocampus abdominalis*, with the aid of next-generation sequencing technologies, and detail a series of behavioral experiments aimed at clarifying the role of sexual selection in generating MHC diversity in this species. The results of these experiments are counterintuitive, and may help to shed light on how genetic variation for ecologically-relevant traits can be maintained in the face of strong directional selection.

2nd Annual CABI Conference: Posters

Undergraduate Student Posters (presenting authors listed)

Robert Fernandez (York College). A step closer to understanding social behavior: social interactions and dopamine in *Drosophila melanogaster.*

Brittany Johnston & Wai Lam (LaGuardia Community College). The effects of alcohol addiction on courtship, mate choice and fertility in *Drosophila melanogaster.*

Weily Lang (LaGuardia Community College). Antioxidants boost male fertility: the role of reactive oxygen species (ROS) in modulating fertility and sperm viability in *D. melanogaster.*

Nora Mahmoud (College of Staten Island). Behavioral and physiological measures of a successful conspecific colony intrusion in the naked mole-rat.

Jeannette Raymond (St. Francis College). Seals, surveys, and statistics: are seals returning to NYC and is local environmental education needed?

Lainga Tong (Hunter College). The effect of natural and artificial colors on the egg rejection behavior of a cuckoo host.

Alexsandra Zviaguine (Hunter College). The lateral line & copulatory behavior in male *Gambusia affinis.*

Faculty/Graduate Student Posters (presenting authors listed)

Zachary Aidala (Hunter College). Ultraviolet visual sensitivity in avian brood parasites and their hosts.

Jonathan Benichov (Hunter College). Exploring vocal interactions using an adaptive playback interface: effects of dynamic feedback on vocal engagement in zebra finches.

Mohamad Beydoun (Brooklyn College). Laboratory video analysis of the scavenging behaviors of nautiluses.

Daniel Bronson (Hunter College). 5-HT5A receptor activity modulates goldfish startle behavior.

Samantha Cohen (Hunter College). Multimodal sensory integration in the goldfish startle response.

Kaitlin Coleman (Hunter College). Bottlenose dolphin (*Tursiops truncatus*) bubble production in front of a mirror.

Zack Ghahramani (Brooklyn College). An intrasexual morphometric analysis of catecholamine cell groups in a vocal fish species with alternative reproductive tactics.

Oswaldo Gil-Guevara (Rutgers). Adjusted phonotactic reactions towards sound intensity and fine temporal traits mediate territorial defense in the poison frog *Oophaga histrionica.*

Stavros P. Hadjisolomou & Alla Chavarga (Brooklyn College). Behavioral responses to pulses of light in the longfin inshore squid.

Mark Hauber (Hunter College). Natal philopatry in brown-headed cowbirds.

Julia Hyland Bruno (Hunter College). Song learning beyond imitation: coordinated singing activity in zebra finch social groups.

Chenghui Ju (Queens College). Study of songs of the house finches (*Carpodacus mexicanus*) on the east coast.

Khaleda Khan (Queens College). A day in the life of a male African village weaverbird (*Ploceus cucullatus*).

Suzanne Macey (Fordham University). Assessing suitable nesting habitat for bog turtles: expert opinion vs. turtle selection.

Jonathan Perelmuter (Hunter College). Hearing thresholds vary by sex in the African cichlid *Astatotilapia burtoni.*

Eric Angel Ramos (Hunter College). Benthic foraging and associated acoustic emissions by bottlenose dolphins (*Tursiops truncatus*) at Turneffe Atoll, Belize.

Alfie Supan (Brooklyn College). Annual patterns of nest construction in an invasive parrot in Brooklyn.

1st Keynote Speaker (9:30am – 10:30am): Jaak Panksepp (Washington State University) -- The archaeology of mind: basic emotional feelings of the other mammals – do they exist and are they similar to our own?

Professor and Baily Endowed Chair of Animal Well-Being Science, at the Department of Integrative Physiology & Neuroscience, College of Veterinary Medicine, Washington State University. His scientific contributions include more than 400 papers devoted to the study of basic emotional and motivational processes of the mammalian brain. His recent work has focused primarily on the subcortical brain mechanisms of sadness (separation distress) and joy (play and animal laughter), work that has implications for the treatment of depression and ADHD. His work is informed by exploring the consequences of basic knowledge about emotional endophenotypes for better understanding of human mental health. His monograph "Affective Neuroscience" (Oxford, 1998) outlined knowledge about and empirical ways to understand brain affective processes neuroscientifically; the "Textbook of Biological Psychiatry" (Wiley, 2004) focused on how elucidation of emotional processes can facilitate psychiatric practice; and "Archaeology of Mind" (Norton, 2012) summarized how how such knowledge can inform psychiatric and psychotherapeutic practices.

2nd Keynote Speaker (1:50pm – 2:50pm): Patricia Brennan (UMASS Amherst) -- Sexual conflict and genital evolution: removing the 'gate' out of 'duckpenisgate'

Patricia Brennan graduated from college as a Marine Biologist in Colombia where she did her thesis research on heart function in whales and dolphins. Shortly after defending her thesis she went to work for the Whale Conservation Institute living on board a research vessel (the R/V Odyssey) doing cetacean surveys in the Galapagos Islands. She lived on board for almost one year, and then came to the USA to write reports and apply for permits for another trip, this time to the Coco's Islands off Costa Rica, where she spent almost 5 months. She completed her PhD on Animal Behavior at Cornell University in 2005, where she studied the nesting biology and mating system of Great tinamous (*Tinamus major*) in Costa Rica, under the guidance of Professors Stephen Emlen and Paul Sherman. She was awarded an NSF post-doctoral fellowship and split her time between Yale University working with Professor Richard Prum and Sheffield University working with Professor Tim Birkhead. During this time she began her studies on bird genitalia and sexual conflict. She is now a research professor at UMASS Amherst, where she has continued her work on birds, and now expanded to other vertebrate taxa, including squamates and mammals.

Public Keynote (6:45pm – 7:45pm): Stephen Pruett-Jones (University of Chicago) -- Monk parakeets in the United States: biology, behavior, impact, and public perception

Steve Pruett-Jones is a faculty member in the Department of Ecology and Evolution at University of Chicago. His research focuses on studies of wild birds and he is interested in social behavior and evolutionary biology, from all levels of analysis including field observations of naturalistic behaviors, molecular analyses, and theoretical studies. He has conducted fieldwork for more than 35 years, in the United States, Australia, and Papua New Guinea, on birds as diverse as birds of prey, shorebirds, birds of paradise, bowerbirds, and fairy-wrens. His work on monk parakeets began in 1988 when he joined the faculty at University of Chicago and he has studied monk parakeets in Hyde Park since then. Dr. Pruett-Jones is currently writing a book about parrots in the United States.