The ring-neck dove (*Stetropelia risoria*) has a three phase breeding cycle. The first phase is courtship, which includes the courting ‘bow-coo’ call from the male and female, nest building, and copulation. Once the female lays an egg the incubation phase begins. The incubation phase lasts approximately 14 days. The male and the female take turns incubating the eggs. The third phase, brooding, begins when the eggs hatch. Again, the male and the female both contribute to parental duties such as feeding the young squabs and incubating them. The duration of the brooding phase usually lasts until the doves reach maturity 21 days after hatching. The male and female remain together in a bond throughout the breeding cycle and cooperate in raising and caring for young. This bond is referred to as the pair bond. The following research studies have examined different aspects and interpretations of the pair bond and shared parental behavior. One explanation for the formation of the pair bond is that it provides the male with the opportunity to ensure his own reproductive success.

This theory was tested by Erickson, Kessel, Lumpkin, and Zenone (1982). In this experiment the physical and visual proximity of the male to the female was measured during the female’s fertile and unfertile periods. A female would be fertile during the courtship phase, and toward the later days of the brooding phase. The results from this study reveal that the male keeps the female in his line of sight during the fertile periods of her reproductive cycle more often than during her infertile periods. The authors of this study suggested that the purpose of this ‘surveillance’ is to ensure that he is the only male that has access to the female and therefore, the opportunity to inseminate her. Thus,
according to this interpretation, the pair bond serves to ensure a male’s reproductive success via surveillance of the female (Erickson, Kessel, Lumpkin, & Zenone, 1982).

Another purpose for the pair bond was proposed by Ball and Silver (1983). In a series of experiments this study examined the timing of incubation for males and females in a pair bond. Among the various results was the finding that switching birds in the middle of the incubation period disrupted incubation timing in both males and females. An explanation for this result is that even though males and females have similar incubating times overall, individual differences exist. Cooperative incubation is important for dove reproduction; eggs fail to hatch if left unattended for too long. Therefore, a necessary task of bonded birds is to synchronize with the idiosyncrasies of its mate in incubation. This feat is facilitated by sufficient exposure to and experience with one bird. To this end, the function of the pair bond may be to set up an efficient incubating system within the pair. Another result of this study was that males incubated eggs that were not their own. This behavior suggests that the male’s parental behavior is not solely determined by his own reproductive success. Eggs and the nest seem to be inherently reinforcing, and these stimuli in and of themselves may be powerful enough to elicit parental behavior in male dove.

Yet another study focused on hormonal and situational determinants of reproductive behaviors in males (Silver, Feder, & Lehrman, 1973). Males were placed in conditions with different external stimuli. The external stimuli conditions included whether the subject was placed in a chamber with another male, with a female, alone, and with or without nesting materials. Afterwards the incubation behavior of the male subject was measured. Males exhibited more incubation behaviors when a female and a nest were
present. According to these findings, the presence of a female and nesting materials may form the basis of the pair bond; these two stimuli best facilitated incubation behavior in males. This study also shows that these specific cues may reinforce the male’s contribution to parental care in the pair bond.

Moore (1976) demonstrated the effects of presenting males with mates to unfamiliar females. The males –which were in various breeding phases with a bonded mate – all copulated with the unfamiliar females. In this study, males did not show a preference for bonded over non-bonded females. The female in a bonded mate is therefore no more reinforcing than in unfamiliar female. This indicates that the mate itself may not be the most salient component of the pair bond. Also, it does not explain why males remain with one bonded female throughout a breeding cycle if he does not prefer her over other females. Another factor must play a role in the formation of the pair bond.

It is possible that the main reinforcing factor behind the male’s attraction of the female is the opportunity for copulation. The feasibility of this idea was demonstrates by Burns-Cusato and Cusato (2005). This study was conducted to evaluate the feasibility of using doves for sexual conditioning procedures. In this experiment males were motivated to approach a CS light paired with access to the female and the nest during all phases of their reproductive cycle. The results revealed that the male approached the female during every phase of the reproductive cycle, even those which did not result in copulation. During the incubation and early brooding phases the female is less fertile; therefore copulation generally does not occur during these phases. However, the males approached the female and the nest regardless. This evidence shows that copulation may not be solely responsible for the formation and maintenance of the pair bond.
These studies reveal evidence for factors which may influence the formation and maintenance of the pair bond, and of male parental behavior. Two of these studies suggest that the presence of the mate and attraction to the mate is not the most salient factor for the formation and maintenance of the pair bond. Moore (1976) suggests that the presence of the mate and attraction to the mate is not the most salient factor for the formation and maintenance of the pair bond. Burns-Cusato, Cusato, and Daniel (2005) found evidence to refute the idea that copulatory opportunity forms the basis of the pair bond. The other studies suggest which stimuli may contribute to parental behavior and the function of the pair bond. A theory proposed by Ball and Silver (1983) is that one of the purposes of the pair bond is to facilitate the coordination of incubation behaviors shared between the male and the female. Another theory states that the pair bond and the male’s contribution to parental care exists to ensure his reproductive success. This theory produced mixed results. Lumpkin, Kessel, Zenone and Erickson’s (1983) discovered that males are more vigilant of the females during their fertile periods, which supports the reproductive success theory. However, Ball and Silver’s (1983) results refute this idea in that males incubated eggs that were not their own. Rather, this observation suggests that the nest and egg may be inherently reinforcing, and that this facilitates male incubation behavior. This idea was supported by Silver, Feder, and Lehrman (1973), who discovered that the presence of the nest facilitated incubation behavior in males.

Past results lead to the main question addressed in this project: What motivates the male to contribute to parental care and remain in a pair bond with the female throughout the breeding cycle? Previous studies indicate that the nest possesses qualities which male and female doves find inherently reinforcing. In other words, the nest may
possess qualities which may elicit behaviors associated with mutual parenting and monogamy in pair bonds. This series of experiments was designed to test the theory that the mechanism which regulates the pair bond and male incubation behavior is a function of the inherent reinforcing value of the nest. The first experiment – Nest Conditioned Place Preference – conducted during the spring semester of 2006, was designed to test for the reinforcing qualities of the nest.

To test for reinforcement in the nest, conditioned place preference was utilized in the first experiment. This procedure works by pairing a stimulus with a specific context. If the stimulus is reinforcing, then the subject should prefer the context which is associated with the stimulus. In this study, the stimulus is the nest.

In accordance with the theory that the nest is an inherently reinforcing stimulus, this study examined three hypotheses:

1. The subjects will spend more time in the context associated with their nest;
2. A male and female in a pair will experience the same context associated with the nest, so there will be no difference in context preference between the males and females of the same context condition;
3. The subjects will show no difference in context preference during the incubation and brooding phases.

This experiment used a 2x3x4 mixed factorial design. The first independent variable was the sex of the subjects, and its levels were male and female. The second independent variable was color context paired with the nest, and its three levels were red, blue, and mixed. The first two variables were between-subject variables. The last independent
variable was within a subject variable, and it referred to the four days of the breeding cycle when tests were run.

**Method**

**Subjects:**

The subjects used were 8 male and 9 female ring neck dove (*Streptopelia risoria*), hatched and raised in the animal laboratory at Sweet Briar College. All doves used in the experiment were at least six months old. Some of the subjects were sexually naïve. During the experiment the doves were housed in home cages. Upon the completion of the trial the subjects were moved to the colony to be used in future experiments.

**Apparatus:**

Two cages were utilized for this experiment. The first cage was the home cage in which the doves were housed throughout their breeding cycle. Each of the 11 plywood home cages was divided into two chambers. Each chamber was 122 cm in length, 61 cm in width, and 91 cm in height. Lighting was provided by a 40w bulb in each chamber on a 16 hour day and 8 hour night cycle. A door in the divider – which was 15 cm wide and 20 cm high – allowed the birds to pass from one chamber to the next. Each cage was equipped with a nest bowl, a water bottle, and a metal feeder. The second cage was used as a test cage. It was also a two chamber apparatus with a door in the divider to allow the subjects to cross into the other chamber. Each chamber in the test cage was 50 cm wide, 60 cm high, and 60 cm in length. The doorway in the divider between the two chambers was 20 cm high and 16 cm wide. One chamber was covered in red checkered contact paper while blue striped paper was hung in the other. An opening in the top of the chamber provided a view of the divider and the door below. Various devices were used to
record the subjects’ movements between the chambers. A Cannon Digital Video Camcorder was mounted above the test cage to track and record the subjects’ crosses from one chamber to the next. A nNovia and a Canopus ADVC-100 Advanced DV Converter were used to convert the camera recordings into media files. Footage fed into a Panasonic television was recorded on 6-hr Sony VHS T-120 tapes as backups of the trial recordings.

Procedure:

A male and female dove were placed in the home cages and allowed to proceed through one breeding cycle. Upon the appearance of the first egg, colored contact paper was hung on the cage walls. The contexts associated with the nests were formed by hanging different colors and patterns of contact paper on the walls of the cages. Three different context conditions were used in this study: Each pair was assigned to one of three contexts: Subjects assigned to the blue paired condition had blue striped contact paper on the chamber containing the nest, and red checkered contact paper in the other chamber. The red paired subjects had red checker contact paper in the nest chamber and blue contact paper in the other chamber. The unpaired condition, which served as a control group, had equal amounts of both red and blue contact paper hung on the walls of both chambers. The food and water were placed on one side of the chamber and the nest bowl was placed in the second chamber to ensure that the subjects received and equal amount of exposure to each context.

Conditioned place preference tests were run four times during the breeding cycle: days six and twelve of incubation, and days six and twelve of brooding. Tests consisted of one 10 minute trial. For the trial each subject was placed in the doorway connecting
the two chambers. The mounted camera recorded the subject’s behavior near the door. The recordings were converted into media files and scored using Observer software, a program which displays video recordings of trials and tools to measure behaviors on the video. The variable that was measured was time spent in each context.

**Results**

*Analysis for Males and Females:*

The first analysis calculated was a three-way, 2x3x4 mixed factorial ANOVA for sex, breeding phase, and context condition. The main effect for breeding phase was not significant $F(3, 23) = 1.24, p>.05$. The main effect for sex was also not significant. The same ANOVA calculated that the interaction between sex and breeding phase was not significant. $F(3,33) = 2.09, p>.05$. The ANOVA calculated for breeding phase and context condition and did not yield significant results. Also, the interaction between all three variables – sex, context condition, and breeding phase – was not significant. The ANOVA revealed that there were differences between the blue, red, and mixed conditions for context preference.

**Table 1**

*Main Effect for Context*

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>.602</td>
<td>.419</td>
</tr>
<tr>
<td>Blue</td>
<td>.467</td>
<td>.364</td>
</tr>
<tr>
<td>Mixed</td>
<td>.799</td>
<td>.281</td>
</tr>
</tbody>
</table>
The main effect for context, shown in the table above, was marginally significant. F(2, 23) = 3.69, p=.059. Figure 1 shows that the red group and the mixed group spent over 50% of the time in red on average.

![Main Effect for context](image)

**Figure 1.** Main effect for context as an average proportion of time spent in the red context for each context condition.

The interaction between sex and context was not significant, F(2, 33) = 2.73, p>.05. However, the females’ context preferences shown in Figure 2 appear to differ from the males’. To further investigate this difference, a second analysis was run excluding the data for the male subjects.
Interaction Between Context and Sex

Figure 2. Interaction between context and sex with respect to average proportion of time spent in the red context for each context condition.

*Analysis for Females:*

This test was an ANOVA run for context and breeding phase. The analysis revealed a significant difference for the main effect of context for females. The means and standard deviations for the females in each group are shown in Table 2.

**Table 2**

*Main Effect for Context (Females)*

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>.658</td>
<td>.486</td>
</tr>
<tr>
<td>Blue</td>
<td>.305</td>
<td>.303</td>
</tr>
<tr>
<td>Mixed</td>
<td>.934</td>
<td>.132</td>
</tr>
</tbody>
</table>

Table 2. Average proportion of time female subjects in each group spent in red.

Females in red, blue, and mixed context conditions differed significantly from each other in context preference. F(2, 15) = 6.59, p<.05. The interaction between
breeding phase and context was not significant. The main effect for breeding phase, shown in the line graph below, was not significant. The graph shows an increased learning effect over time, especially for the females in the blue condition.

![Main Effect for Breeding Phase (Females)](chart)

**Figure 3.** Change in average proportion of time spent in red for each context condition across the breeding cycle.

Figure 3 shows that the blue group’s average time in blue increased over time. The proportion of time spent in red also increased across trials for the mixed groups, while the red group’s percent of time spent in red remained relatively constant.

**Discussion**

The main purpose of the present experiment was to test for the reinforcing qualities of the nest. The reinforcement value of the nest was measured by the preference for the context associated with the nest. The first hypothesis stated that subjects would prefer to spend more time in the context associated with the nest. The results supported this hypothesis. Subjects in the red paired condition spent more that 50% of their time in
red and the subjects in the blue condition spent less than 50% of their time in blue. The subjects in the mixed group were expected to spend about the same proportion of time in both contexts – showing no preference for either. However, according to the results, the mixed group spent more than 50% of its time in the red context. This trend may reflect an innate preference for the red pattern over the blue pattern. This was not evident across all groups however. The subjects in the blue group still preferred blue. This case indicates that the conditioning procedure was effective and robust enough to condition the subjects against their initial, innate preference for red. In effect, even though the subjects may prefer red, the nest is reinforcing enough so that when paired with blue, the subjects showed a preference for blue. However, this preference was not the same for males and females.

The second hypothesis, which stated that there would be no difference for context preferences between males and females was not supported. The results showed that the context preference for males did not vary between the subjects in the three groups. However, females did show preferences for their nest context. These results indicate that the nest was reinforcing for females but not for the males.

The third hypothesis addressed context preference over time. Results showed that context preference between groups did not significantly change across the breeding phase. Therefore, the third hypothesis was supported. However, Figure 3 shows a gradual increase in the effectiveness of the conditioning procedure over time. All groups began with relatively the same amount of time in the red context on the first trial, but differences in the groups became evident and increase over time, which is indicative of a learning effect.
In summary, the present study supported the theory that the nest is an important component of the pair bond. However, these findings can only be applied to one sex. One explanation for these findings is that the mechanism underlying the pair bond may be the result of a summation effect. The collaboration of many stimuli may be responsible to the formation of the pair bond. Therefore, isolating just one of these stimuli in a study may prove insufficient in explaining the pair bond. However, the lack of evidence for single stimuli that explains the males’ behavior is telling nonetheless. This study reveals that the mechanisms underlying the pair bond may not be the same for both sexes. The mechanism that draws the female to the pair bond may not be the same as the mechanism which accounts for monogamous and parental behavior in males.

This study had a few limitations. The sample sizes were small, especially when a separate analysis was calculated with only the female subjects. A second limitation is that the chambers in the test cages were not equidistant from the home cages. The red chamber was closer to the home cages, in which the dove calls coming from the home cages may have been clearer. What appeared as an innate preference for the red context may have been a preference for the chamber in which calls from other subjects were easier to hear.

Overall, evidence was found for the importance of the nest for females, but not for the males. However, previous studies such as Ball and Silver (1983), and Silver, Feder, and Lehrman (1973), show evidence for the idea that the nest is reinforcing for the males. Given this information a second study was conducted during the summer of 2006 for the Honors Summer Research Program. Like the previous study, this experiment tested for the reinforcing value of the nest. However, it focused on male behavior. What
motivates the male to incubate, and in doing so, share parental responsibilities with his bonded mate? Two possible factors may motivate this behavior: the reinforcing value of the nest and the reinforcing value of the female. This experiment was designed to determine the reinforcing qualities of the nest in comparison to the reinforcing qualities of the female. The design of this experiment included two independent variables, each with two levels. The first level was incubation shift. The reinforcing value of the nest was analyzed during the male shift, and during the female shift, and the two were compared. The second independent variable was US type. Two stimuli were used in this experiment: the bonded female and the nest with the egg(s). The male’s preference for either stimulus was determined by measuring how much time the male spent in a zone near that stimulus.

**Method**

*Subjects:*

The subjects used in this experiment were 11 male and 11 female ring neck dove (*Streptopelia risoria*). All subjects were hatched and raised in the Sweet Briar College animal laboratory. All subjects were at least six months old and were housed in the home cages for the duration of the experiment. Food and water were provided throughout the experiment. Upon the completion of the experiment the subjects were euthanized via CO2 asphyxiation.

*Apparatus:*

The subjects were housed in home cages throughout the experiment. Each of the six cages was divided into three chambers. The central chamber was 122 cm long, 60 cm high and 63 cm wide. Each central chamber was accompanied by two smaller chambers on either side that measured 24 cm in with, 60 cm in height, and 122 cm in length. Two
57 cm wide 23 cm high openings were cut into the walls of the central chamber, allowing the subjects access to the two side chambers. Each opening was covered by two different guillotine-style doors. One was a wooden door. This door covered the opening facing the central chamber. The second was a window – a 1 inch wide wooden frame covered with chicken wire. All doors and windows were 25 cm high and 61 cm long. The doors and windows were each connected to strings that ran through the length of the cage to the exterior of the apparatus. These strings served to allow the experimenters to raise or lower the windows and doors during tests. Each cage was equipped with a water bottle, a metal feeder, and a nest bowl with hay, placed in the middle of the central chamber with the water at the front of the cage and the metal feeder at the back of the cage. The floor of the central chamber was divided into three equal zones: the nest zone, the center zone, and the female zone. These zones were marked with orange yarn woven into the metal grate. The nest bowl and hay were placed into one of the side chambers. The zone which was closest to this side chamber was named the nest zone, and the zone closest to the opposite side chamber was named the female zone. The same electronic devices from the previous experiment were used to record data for this project. A Canon Digital Video Camcorder was mounted on a tripod in front of the cage and recorded the subjects’ crosses from one chamber to the next. A nNovia and a Canopus ADVC-100 Advanced DV Converter were used to create the camera recordings into media files. Footage fed into a Panasonic television was recorded on 6-hr Sony VHS T-120 tapes as a backup of the trial recordings.

Procedure:
Male and female doves were placed in the home cages and were allowed to proceed through the courtship and incubation phases of their reproductive cycle. Habituation trials were run the day after the birds were placed into the cages and continued until the conditioning trials began. The main purpose of these trials was to allow the subjects to grow accustomed to seeing the doors rise and lower as they did during the tests. During habituation, mock trials were run in which both the doors and windows were lowered, blocking access to the two side chambers. After 10 minutes, the doors were raised but the windows remained lowered. The windows allowed only visual access to the side chambers. After another 5 minutes the windows were raised as well, allowing complete access to the side chambers. These habituation trials were run twice a day – once in the afternoon and once in the evening. Otherwise, the doors and windows remained raised.

The appearance of the first egg signaled the beginning of the conditioning procedure. The first recorded tests were run the following day for 12 days of incubation cycle. During the test the 2 doors and the 2 windows of the cage were lowered, blocking access to both side chambers. The male was placed into the central chamber while the female was placed into the side chamber opposite the nest chamber. The doors and windows remained lowered for 10 minutes, which signaled the deprivation period. The male’s access to both the female and the nest was blocked. At the end of the 10 minute deprivation period the doors were raised and windows remained lowered to allow only visual access to the side chambers for 5 minutes. During these 5 minutes the mounted camera recorded the amount of time the male subject spent in the zone closest to the female, the zone closest to the nest, and the central zone in between the two. These tests
were run twice a day – once during the female’s turn to incubate and once during the male’s turn to incubate.

**Results**

*Analysis for Shift:*

For the first analysis the average percent of time the subjects spent in the nest and female zones was calculated across the 12 days. This analysis was done with an ANOVA, using Incubation shift as an independent variable. Males spent significantly more time near the nest zone during their shift than during the female shift $F(1,20)=8.69, p<.05$. The main effect for nest zone is shown in Figure 4. The means table for this analysis is shown in Table 3.

![Main Effect for Nest Zone](image)

**Figure 4.** Average percent of time spent in nest zone during the male and female shifts.

**Table 3**

*Main Effect for Nest Zone*

<table>
<thead>
<tr>
<th>Shift</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Shift</td>
<td>54.2</td>
<td>12.3</td>
<td>2.35</td>
</tr>
<tr>
<td>Female Shift</td>
<td>34.1</td>
<td>18.4</td>
<td>2.90</td>
</tr>
</tbody>
</table>
The subjects also spent more time in the female zone during the female shift than the male shift, and this difference was marginally significant $F(1, 20)=4.12$, $p=.056$. The main effect for female zone is shown in Figure 5. The means table showing the main effect for female zone is shown in Table 4. There was no difference between the average time spent in the center zone between the two shifts $F(1,20)=3.68$, $p>.05$.

<table>
<thead>
<tr>
<th>Shift</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Shift</td>
<td>56.86</td>
<td>17.978</td>
<td>5.423</td>
</tr>
<tr>
<td>Female Shift</td>
<td>34.73</td>
<td>17.214</td>
<td>5.19</td>
</tr>
</tbody>
</table>

**Figure 5.** Average percent of time spent in nest during male and female shift.

**Table 4**

*Main Effect for Female Zone*
Male Shift | 18.97 | 10.76 | 3.25  
|-----------------|--------|--------|--------|
Female Shift    | 30.99  | 16.42  | 4.95   

**Analysis for Zone Preference:**

A second ANOVA was calculated using the zones as the independent variables and the incubation shift as the dependent variable. This analysis was run to address the second hypothesis, and to observe the amount of time spent in each zone relative to the other zones during both shifts. There was a significant difference between the time spent in the three zones during the male shift $F(2, 30)=26.48$, $p<.05$. The main effect for male shift is illustrated in Figure 6. The means table for this analysis is shown in Table 5. A Post-hoc Tukey test revealed that there is a significant difference between the time spent in the center zone vs. the nest zone during the male shift. Also, there is a significant difference between the time spent in the nest zone vs. the time spent in the female zone during the male shift.

![Main Effect for Male Shift](image)

**Figure 6.** Average percent of time spent in each zone during the male shift.

**Table 5**

*Main Effect for Male Shift*
The time spent in the three zones overall was not statistically significant for the female shift $F(2,30)=.165$, $p>.05$, nor were there any significant interactions detected by the Tukey test. Figure 7 depicts these results. The means table for the main effect for female shift is shown in Table 6.

<table>
<thead>
<tr>
<th>Zone</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nest Zone</td>
<td>56.86</td>
<td>17.99</td>
<td>5.42</td>
</tr>
<tr>
<td>Center Zone</td>
<td>23.21</td>
<td>9.88</td>
<td>2.98</td>
</tr>
<tr>
<td>Female Zone</td>
<td>18.97</td>
<td>10.76</td>
<td>3.25</td>
</tr>
</tbody>
</table>

**Figure 7.** Average percent of time spent in each zone during the female shift.

**Table 6**

*Main Effect for Female Shift*
<table>
<thead>
<tr>
<th>Zone</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nest Zone</td>
<td>34.73</td>
<td>17.21</td>
<td>5.19</td>
</tr>
<tr>
<td>Center Zone</td>
<td>34.28</td>
<td>16.41</td>
<td>4.95</td>
</tr>
<tr>
<td>Female Zone</td>
<td>30.99</td>
<td>16.42</td>
<td>4.95</td>
</tr>
</tbody>
</table>

The results of the second analysis, illustrated in Figures 8 and 9, show a line graph of zone preference over the 12 trial days. One graph was made for the male shift and another was made for the incubation shift.

**Figure 8.** Average percent of time spent in zones across the 12 day testing period for the male shift.
As these two graphs demonstrate, the subjects’ time spent in the zones is not consistent; rather, the results found that tests run during the male shift differ from those obtained from the female shift. Namely, the males show a preference for the nest during their incubation shift, but not during the female’s incubation shift.

**Discussion**

The first hypothesis stated that the male would spend more time in the zone closest to the nest than the zone near the female. This hypothesis was supported, which implies that the male finds the nest more reinforcing than the female. The second hypothesis stated that the male would spend more time in the nest zone during his shift to incubate than the female shift. This hypothesis was also supported. The male subjects seemed to find the nest more reinforcing when it was their turn to sit on it. The results also reveal a marked difference in the nest’s reinforcing value from the male shift to the female shift. The graphs indicate that the reinforcing value of the nest is not constant or static – rather it changes throughout the day. The key factor in this change is incubation.

*Figure 9. Average percent of time spent in zone across the 12 day testing period for the female shift.*
shift. The male’s preference for the nest depends on whether or not it is his turn to sit on the nest.

This result may be the key factor in the differences in results obtained by the two experiments. Even though clear signs of the reinforcing value of the nest were seen in this experiment, the previous experiment found evidence for the reinforcing value of the nest for females, but not for the males. Why were different results obtained from two experiments that were both designed to test for the reinforcing qualities of the nest? A likely explanation is that the males find the nest reinforcing, but to a lesser degree than the females. This effect is more subtle for the males, and the manipulation of the previous experiment may not have been strong enough to tease out these more subtle effects. However, the design of the second experiment was more sensitive, and thus able to pick up on the reinforcing value of the nest for males. The main difference between these two experiments is that the second controlled for incubation shift. The reinforcing value of the nest for the male turned out to be dynamic rather than static – it was only apparent during the male’s shift. Therefore, it is not surprising that the CPP experiment – which did not control for incubation shift – did not pick up on this effect.

Overall this experiment supports the overarching theory upon which these experiments are based: that the nest is a powerful stimulus and a key component in the function of the pair bond and shared parental duties. According to these two studies, the nest is inherently reinforcing for both the male and the female. This mutual attraction to the nest may be an important mechanism behind the formation and function of the pair bond. The male and female may form this bond because both find the nest inherently
reinforcing. Also, the inherent reinforcing value of the nest may be the motivating factor behind the male’s contribution to parental care.

The nest CPP experiment should be replicated and improved upon in future studies. Measures should be taken to strengthen the manipulation, and thus make it more sensitive to detecting differences in nest reinforcement. This can be achieved by using different colors. As noted, the subjects seemed to have an inherent preference for red over blue, which may have confounded the results. Yellow and green should be used in the replication study as these colors have proven to be effective for conditioned place preference in the past. Using solid colors instead of more complex patterns should also strengthen the manipulation. Also, instead of covering two walls with the context paper as was done in nest CPP, covering the entire cage with the colored paper may also strengthen the manipulation. Lastly and most importantly, a replication of Nest CPP should control for incubation shift. This can be done by running tests during both the male’s and the female’s turn to sit on the nest. The second experiment demonstrated that doing so was crucial in detecting the reinforcement value of the nest and in monitoring how it changed according to shift.