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Part E. Housing and General Management (Panel 2)

edited by
Richard Fyfe
Canadian Wildlife Service
10015 103rd Avenue
Edmonton, Alberta, Canada

Panel Members: Richard Fyfe, Chairman, James Enderson, Heinz Meng, James Weaver.

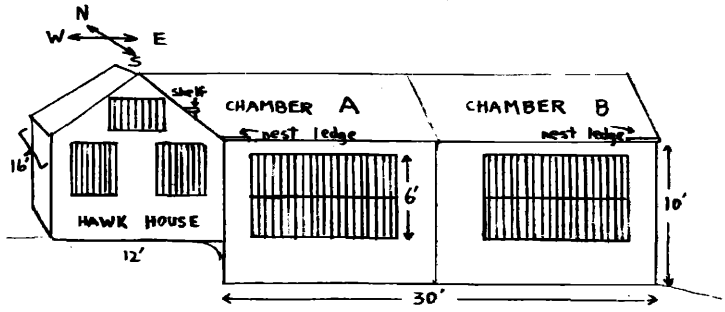
HUNTER. I'll introduce the next panel which is Housing and General Management and Richard Fyfe is chairman of this panel.

FYFE. Thank you, Don. Since several of our panel members won't be able to make it, I've asked Dr. James Enderson and Mr. Jim Weaver to fill in and I'm very pleased that these people have accepted. Of the original panel Dr. Meng and myself are here and we thought that we would begin by first generally outlining our facilities and what we feel are the strengths and weaknesses of these. Then go through the various aspects of raptor facilities point by point and hopefully open this to some discussion from the floor. The panel will be Dr. Meng, Jim Weaver, Jim Enderson and myself, and I think if you're ready, Heinz, we'll go right on into the description of your facilities.

MENG. My work with raptor breeding and the development of my breeding facilities started many years ago. In 1946 I caught a passage female Red-tailed Hawk that I have kept for the past 26 years. She has been kept on an outside perch throughout the year next to an enclosure into which she can fly when it is stormy. She has laid two or three eggs each spring since she was four years old. Usually I substitute these for glass eggs and allow her to incubate them one year. She even incubated the eggs in snow following a late storm in April. She

is tethered throughout the year and builds her nest on the ground next to the perch. Several times we have provided her with foster young and she has fed and cared for these birds conscientiously. One year I removed her first clutch of three eggs and three weeks later she had recycled and laid two more eggs. Many hawks when they become older become sort of like brood hens and will raise almost anything that is put under them. She has even raised a chicken which she hatched and raised to about three weeks of age. Whenever the chick got cold it would go under the red-tail just as if it were the mother hen. Unfortunately one night there was a thunder storm and the chick walked away and died of exposure.

My breeding chamber initially began with a small white-painted hawk house built in 1953. In 1963 I built an addition to the hawk house specifically designed as a breeding chamber for a pair of passage tundra Peregrines. The breeding chamber is located in our back yard and is very secluded. It is surrounded by many shade trees so that it is quite cool in the summer, also there is a swampy woods in back. As illustrated the breeding chamber was attached to the original hawk house.



At first the 1964 pair of passage Peregrines (*Falco peregrinus tundrius*) had the entire chamber to themselves, but in 1969 this chamber was partitioned to make two separate chambers. The partition was made out of 2x4 lumber and covered with burlap on each side. Entrance is through the hawk house into chamber A; in order to get to chamber B one must go through chamber A. Therefore, by going through the hawk house there is always a closed door so that the birds cannot possibly escape. Window areas, without glass, are provided in the north and south walls of the chambers. The windows are 6'x10' and are provided with 3/8" vertical hollow aluminum rods placed 2½" apart center to center. The window areas facing north are 4'x10'. On the outside the aluminum bars are covered with 2"x4" mesh welded wire coated with vinyl to prevent escape should one of the falcons be able to push between the bars. At the bottom on the window areas on the south there is a 3' wide shelf with a lip 2" high. This whole area is filled with sand. At the end of each shelf there is a large bath pan. At 3' above the bottom shelf there is another shelf 3' wide covered with synthetic rug and astroturf material. The north window areas are smaller but

have no shelves. The upper half of each area is covered with burlap to provide some protection from the north wind but the open lower half allows some wind to circulate through. The floor is of cement. Perches and shelves are arranged so that the birds cannot defecate on them from above. There are only three rafters in each chamber and these are covered with rug or astroturf. The birds usually use these to roost on since they are the highest perches available. The interior of the breeding chamber is unpainted, and the walls are of homosote board, a pressed fiber material. Although there are lights in each chamber they were not used during the 1971 season. In chamber A, which houses the Peale's Peregrines, the nest ledge runs north and south along the eaves of the original hawk house. The ledge is two feet wide and has a lip of rug covered 2x3 inch wood, sand about 2 inches deep fills the entire ledge (dimensions 2x15 feet). The part of the hawk house roof that is covered by the breeding chamber forms a darker area above the nest ledge. Half way up this sloping roof is a horizontal shelf about one foot square; often both birds sit on this ledge together. A one-way mirror has been installed in the peak to facilitate observations of the pair. The perches are all padded. In addition to the ledges there are a couple of stone ledges (cement blocks) where the birds can sit if they so desire.

Successful Peregrine Breeding in Captivity. The Peale's Peregrines used in the successful breeding attempt were taken from the Queen Charlotte Islands in British Columbia in 1967. They were taken almost as branchers and each bird was from a different eyrie. The birds were initially handled for about a month and were then put in a small holding chamber which was about 12 feet x 4 feet x 7 feet high (the south end of the original hawk house), and here they were kept for the next two years. At two years of age, the pair was put into the breeding chamber which was 10 feet x 15 feet x 10 feet high at the eaves (chamber A).

The pair was fed from the outside of the breeding chamber and as early as the fall of 1970, the male became quite aggressive. Their food consisted mostly of fat, healthy, freshly killed homing pigeons. As a precaution against trichomoniasis the heads and crops are removed, also the feet. The pigeons are then torn into three pieces by pulling the wings apart, which tears off breast from the breast bone, and then removing the back and legs from the breast piece which is still attached. Viscera are not removed. The food is then fed on the upper window shelf from the outside. Both birds come to the ledge and take the food from my hand. Also day old chicks and an occasional rabbit have been fed to this pair of birds. No drugs or vitamins were used, although wheat germ oil was mixed with yolk and put on the meat for about a week during the end of February, but they don't like the taste. At about the time of egg laying, the male became even more aggressive towards me and would actually try to get me through the bars. Several times I would run along the side of the hawk house in sort of a crouching position and he would be very vocal, run along the window shelf, and try to attack me. I feel that this stimulated him sexually and perhaps had something to do with his being fertile. Often I could look in from the outside and see the falcons glaring down at me with their wings poised for a flying

attack.

The birds were both very vocal and four eggs were laid at two day intervals starting March 4, 1971. After eight days of incubation the eggs were candled and found to be infertile. These eggs were then removed and 13 days later the falcon had recycled and laid four more eggs. For each clutch incubation started with the third egg and the female did most of the incubation at the beginning, but as time went on the male did more and more. Copulation was not observed and it is felt that it probably occurred on or above the nest ledge. Incubation of the second clutch was not interrupted and three eggs hatched on May 8th and one young on May 10th. During the incubation period the male took food to the nest ledge and gave it to the female. It was noticed that the female went to the nest site and started plucking and eating at the time the young were peeping. On May 10th, two days after I heard the first peeping I finally climbed to the nest ledge. I hadn't disturbed the falcons since the laying of the third egg of the second clutch. When I climbed to the ledge (1:00 PM) I found two dead young, one almost dead, and another just hatching. I brought the young into the house, but the one which was almost dead died shortly after, and the one that was hatching was out of the egg at 2:00 PM and immediately ate three small pieces of fresh pigeon breast meat. For the next ten days he was fed mostly skinned eviscerated day old chicks. These were cut up and fed with round tipped forceps; all of the bone and cartilage was fed along with the meat. A 40 watt bulb was used for heat and was so regulated that the temperature stayed at about 35 C (95 F). The bird was able to move away from the light if it felt too warm.

It appears as though the female fed herself at the nest ledge but did not feed the eyasses although she brooded them well. I did not use any supplementary vitamins and on occasion I did give him little slivers of fresh pigeon breast. However the main diet was day old chicks. During his 14th day of life he consumed eleven chicks. The skin and feathers were removed so that there would be no pellet forming material. Every two hours I simply fed him a full crop and I did not have to wait for pellet regurgitation.

In summary, the results of the 1971 breeding attempt are as follows:

First clutch—4 infertile eggs laid, removed on eighth day.

Second clutch—4 eggs laid, all fertile, all hatched—three of the four young died apparently due to inexperience of female, the fourth young was successfully hand-reared with the result that one Peale's tiercel was produced. He is in perfect health and plumage, with no hunger streaks and weighs 24 ounces.

THOMAS. At what age was the eyas removed from the parents?

MENG. He was removed before he came out of the egg, just at hatching. Actually the three eggs began hatching on May 8th. I heard a lot of peeping and I provided food on the window ledge. The male came and brought the food up to the female and I could see her plucking it. I could see the back of her tail and the young ones were peeping so I thought everything was going fine and I pro-

vided them with a pigeon twice a day torn into three sections. On the following morning I went out again and as soon as she got off the young ones started peeping and the same thing happened, that is the male brought the food up and she began eating. On the third morning I didn't hear any peeping so I decided that I had better look because I hadn't been up there since the third egg of the second clutch. I didn't want to disturb them and when I went up there again I saw that two young were dead and another was practically dead. The fourth was just coming out of the egg. Apparently the female had gone up there and fed herself but hadn't fed the young ones although she was brooding them. As soon as I saw that I grabbed everything and hand-raised the last young in the kitchen. I put him under a lamp and fed him about every two hours. It was unfortunate that that happened. Several others have had young prairies and the females fed their eyasses all right, but this female apparently fed herself but didn't feed the young. Next spring what I plan to do is take them when she hatches them and put additional eggs under her for about one week, raising the young inside. Then I will re-substitute so she'll be getting a group of young that are a week old already. Maybe she will be mature enough then so that in the future perhaps I won't have to continue in this substituting.

VOICE. What is the floor covering?

MENG. Just cement, but they rarely go down onto the floor unless it is to catch a live chick that may have fallen down from the feeding shelf.

ENDERSON. Do you keep the pair together year round?

MENG. Yes. They have been together for as long as I have had them. When I first got them they were put in the original hawk house in a four foot wide section that I had partitioned off. They were there for three years while the tundra birds had the complete run of the breeding chamber. Since then they have been in chamber A.

VOICE. How much manning have these birds had?

MENG. The first year that I had them, for a period of about a month and a half, perhaps two months I would take them out and put them on block perches and take them in at night, putting them on my elevated shelf perches.

VOICE. What about the diet of the adults prior to egg laying.

MENG. The diet consisted mostly of freshly killed homing pigeons, also day old chicks.

THOMAS. Did you have problems with wind, etc., and disturbance?

MENG. Not too much. If you think back I mentioned that on the northern

exposure, the north windows are 4x10 feet with the top two feet covered by burlap woven between the bars. So there is just a 10x2 foot wide strip that is open on the north exposure, with the result that there is no difficulty and they are out of the wind.

THOMAS. Did you ever, like Jim Enderson has done, try using barrels to try and stimulate more of an eyrie cave type situation? I have seen a prairie project where there were ledges and nothing was happening, but the day they put one barrel in the prairies were in there clucking and just going crazy. They seem to like the protective nature of such a situation.

MENG. I haven't used barrels, but as I mentioned the nest site was back in the corner in the most hidden area of the breeding chamber.

WEAVER. The new facility at Cornell University, Ithaca, New York is a steel sheeted building 227 feet long and 47 feet wide. It is divided inside to house 38 pairs of birds in 38 separate chambers. Thirty-six of the chambers are approximately 10x20x17 feet at the apex of the roof floping to 14 feet at the eaves. The entire area is surrounded by a six foot Cyclone fence with a barbed-wire top. The outside openings of the pens are screened first by one-half inch steel conduit bars. Six inches beyond the bars the outside open area is covered with half inch hardware cloth and the bottom two feet are covered with fiberglass light panel. The fiberglass is primarily to take up the extra space left from the conduit as the conduit lengths are only 10 feet. However it turns out that it is a good idea to keep blowing snow off the bottom of the cages. Inside, the walls of the pens are paneled in plywood. The roof has at least one sheet of light panels that are white. Each room has two or three wall perches, most of which are covered with cocoa matting. We were using hay bales, but with the expense combined with the problem of molding, we have decided to replace these with cocoa mats, which seem to closely resemble the texture of perches used in the wild (that is tundra heather, dwarf birches and that sort of thing). Each room has at least two ledges that can be used for nesting; these are filled with gravel. The edges of all the perches are padded with Tartan Turf, similar to Astro Turf. Each room is vented at the top with half inch hardware cloth behind the wooden bars, situated above the lights. Because the temperature immediately under the steel roof can exceed 100 degrees in the summer we have installed roof ventilators. We feel that with three big ventilator fans the length of the building, we should be able to draw enough air from the front to cool it considerably. Each room has the facility for eight 150w flood lights for artificial lighting, and a pane of one-way glass for observation. There is also a double decked observation hall that runs the length of the center of the building. Of course it is also heated to an extent in the winter so that it will not freeze, and it affords good opportunity for observation. The floors are covered with gravel and we furnish a little bit of straw underneath the perches to facilitate cleaning. Our plans are simply to go in once or twice a year to take the straw out and work the gravel over with a weak solution of formalin as is done in the poultry industry. We

have been feeding a number of birds on the fist in an effort to try to keep them as tame as possible. We don't know whether it is going to be really valuable or not, but in most cases it would seem that the smaller the disturbance caused by entering the pen, the better your chances are going to be. I think in some of them we will completely isolate the bird during the breeding season. That is, we will just put food in through the observation port or something of that sort.

ENDERSON. I am describing the new facility that I built in the past summer at Colorado Springs, which may be of interest to many of you, because the cost involved is considerably less than the larger facilities such as at Cornell. This building consists of five parallel rooms, each six feet wide. Each room is 18 feet long except that the nest ledge on one end adds three more feet to that dimension. There is an enclosed alley-way adjoining one end of all five rooms, with doors opening into the breeding chambers. The outside dimensions are 30x24 feet; the cost is around $1,300 for materials.

Each room is equipped in the same manner. The interior walls are painted white, the floor is dirt. The perches are straw bales, except for the lip of the nest ledge which is covered with nylon carpet. The nest ledge is covered with two inches of coarse sand and small pebbles. In Colorado bales of straw tend not to mold, so they are suitable for use as perches. A lower perch projecting from the wall at eye level, enabling the birds to fly from the floor to the higher perches in two steps is provided.

The opening in the roof is 3x12 feet and is covered with 2x4 inch welded wire.

Behavior of Captive Pairs. The four pairs of Prairie Falcons vary in their adjustment to each other. Members of compatible pairs seem to notice each other; in fact, at times they step on each other's wings and tails without paying much attention to it. I have never noticed any kind of antagonism among two pairs. Another pair, including birds which are about eight years old, appear to me to be poorly adjusted to each other. They are very tense in captivity and easily frightened, even though the female has laid eggs and the male copulated with another female in captivity in 1967. They are tried and proven in that sense, but they seem not to be compatible. In another pair of Peregrines, the female perhaps is dominant over the tiercel and forces him to move. Also with the birds which seem compatible and adjusted in the nesting situation, a play-type of behavior has been observed where the birds appear to play with the wings of three week old chicks which had been a steady in the diet of these birds.

FYFE. In contrast to the previous discussions of breeding projects and breeding facilities, we have been working with a very different situation in that we have been forced to use a large number of different breeding chambers, each with different dimensions, exposures and natural lighting. Due to such factors as availability of buildings, incompatibility of birds or apparent non-adjustment of birds to a given situation, we have had to improvise a great deal and in so doing have experimented with a variety of different situations for perches, ledges and lighting. We have moved our birds around to different rooms and have de-

liberately altered the amount of natural lighting to which they would be exposed. We have experimented with a variety of perches and perch locations and have even painted the insides of the chambers white in order to increase light intensity.

Room Size. Our breeding chambers have ranged in size from the smallest rooms approximately 12x12x6 feet high to rooms as large as 30x20x18 feet high. In general our observations of the larger falcons suggest that the smaller rooms contribute to a high degree to the anxiety of the birds. We have had Peregrines, Prairies and Gyrs in small rooms and it appeared that their inability to avoid the nearness of any intrusion created a great deal of anxiety. In such a situation these birds were observed to fly directly into walls, the bars of windows or into the weld wire. These large birds also appeared to have a tendency to fly just below the ceilings of these rooms with the result that most were constantly tipping their wings as they flew from one perch to another. In contrast, the smaller birds, kestrels and Merlins, did not seem to have the same degree of difficulties in these small rooms, although they also exhibited a degree of anxiety and would fly into the walls or the wires covering the windows, when we entered the pen, otherwise they seemed well adjusted and did not have the same tendency to tip their wings on the ceiling as they flew. One pair of Prairie Falcons kept in a small room of this type did however lay five infertile eggs in a barrel-type nest ledge in 1971. Initially this pair exhibited the same sort of anxiety which we attempted to minimize by staying away from the pen for the most part; however, once egg laying began, aggressive behavior became more dominant, and it was extremely dangerous to enter this small room with this particular pair of birds. In contrast, we had our pairs of adult Peregrine and Prairie Falcons in rooms which were much larger by dimension, roughly 27x17 feet and about seven feet high. Although these birds were not as easily disturbed by our presence there still was a tendency to fly from one end of the room to the other and into the wire screen covering the window. There was not quite the same tendency to fly immediately next to the ceiling and a minimum of feather damage was recorded. In 1970 and 1971 we did not have any birds attempting to lay in these pens although we did provide them with both barrel and open ledges and we believe the primary reasons for the lack of breeding was the fact that we had immature birds included in each pair in these rooms. (This has been borne out since in 1972 we had two pairs lay in these pens.) The next largest chamber that we used was the chamber in which we had successful breeding. This was a room 27 feet long by 12 feet at the apex sloping to about seven feet. The most obvious behavior of the pair in this room was simply that they had a tendency to fly from one end to the other; however, the mere provision of higher perches seemed to result in a major adjustment. It was particularly noticeable that within a couple of days of the placement of the Prairie Falcons into the pen, they would sit above us with relative indifference, in sharp contrast to the frantic flying which had been so prevalent with this pair in the previous pen which had a low ceiling. This chamber was situated on the north side of a barn and consequently received only a small amount of sunlight. Initially, the east

end of the room was covered with one inch weld wire but was later covered with fylon when we observed the birds altering their behavior with the slightest movement or activity observed outside of the building. In order to increase light intensity, the roof of this building had also been opened into long sections which were covered with fylon and the inside of the room had been painted white with the exception of the small area immediately behind the nest ledge. The west end of the building had a large window, 4x6 feet. This window afforded some opportunity for these birds to sit in the sun in the late afternoon or evening. Two small windows on the north side were only about five feet in height and were seldom used by the birds.

The largest pen was the loft of a barn which had been renovated and was felt to be the best of our breeding chambers for the larger falcons. The rough dimensions were 27x28x18 feet high; i.e., it was large enough to provide an opportunity for these larger birds to fly around inside. The birds in this pen did fly a great deal, receiving a considerable amount of exercise and were in excellent condition, judging by their case in making the floor or food ledge to the higher perches. This room was open for the full length on the south side and openings were covered, also part of the east end of the building and a small portion on the roof at the southeast peak of the roof. All open areas were covered with one inch weld wire. Perches were installed specifically so that the birds could sit in these open areas to receive a maximum amount of sunlight. This room was also judged to be the most suitable because of the obvious adjustment of the birds to the breeding chamber. We believe that the height provided the necessary security for the birds and the size of the room, perches and available nest sites seemed to meet the basic requirements. Unfortunately, the pair which were in this room for two years laid infertile eggs both years, as discussed later in the section on behavior.

Lighting and Enclosure Coverings. All of the breeding chambers in the project have been lighted through natural lighting conditions, primarily because the natural lighting at our latitude provides the natural photoperiod for the Prairie Falcon, Peale's and anatum Peregrines. A serious attempt was made in all of our buildings to create as large an opening or alternately flight pens on the south and west sides of the buildings. These were generally in the form of open windows covered with either fylon or weld wire. We also used fylon extensively to cover open areas of the roof or to screen the larger windows so that the birds would not see activities which might disturb them. We have found that the clear fylon is a very suitable material which allows a maximum amount of light, although it does screen ultraviolet we are told. Because of the problem of birds flying into the wire of windows or other openings, we have tried to minimize this by placing perches adjacent to the wire screening. We found that the birds used these extensively and very often this has solved the problem of an individual bird flying into the wire. With Merlins and with Prairie Falcons that were prone to fly into wire, we have used snow fencing on the outside of the wire which creates a visible barrier. The birds tend either to perch in front of the snow fencing, or if they do strike the wire, they strike feet first. This has greatly decreased the number of times the birds have flown directly into the fence and

has virtually eliminated the problem of cut ceres and broken or frayed feather ends.

Ledges. We have used three different types of nest sites. For the larger falcons we have used open ledges with a narrow lip which were filled with turf, gravel or sand or a combination of each. Most recently we have been using a fine gravel and have found this eminently suitable. We have also barrel ledges with a similar substrate; however, in 1971 where we had both barrel ledges and an open ledge in the pens, both the Peregrines and Prairie Falcons chose the open nest ledges. (In 1972 all three pairs of adult birds chose barrel ledges.) The Peale's Peregrines were provided two open nest ledges and one barrel nest ledge the same height in 1971. The second nest ledge is actually lower than the barrel ledge. In the two nesting attempts this pair chose the open ledges. We have also provided barrel ledges in rooms that were without other provision and in the case of one pair of Prairie Falcons they laid in the barrel ledge provided. The third nest site provided was simply an old Magpie nest for our year old Merlins and although we did observe some activity in association with the nests, the birds did not lay. Since this is the normal nest selection in the wild, we felt that this was the logical choice for these birds in captivity; however, because of the difficulty in moving these nests, in the future we will construct our own using twigs and wire frames.

Perches. As indicated, we have tried several types of perches and locations. In general, these have ranged from normal flat wooden perches of 2x4 or 2x6 to round perches usually in the form of natural tree branches. We have tried swinging perches which are simply tree branches tied at each end and suspended from the ceiling and also straw bales, both suspended on walls and left on the ground. Our flat perches have been covered using such materials as cocoa matting and sand or gravel.

By preference, we have now settled pretty well on straw bales, and tree branches for perches. Straw bales are very excellent in our area because they remain dry, can be changed readily, and we believe, they provide some relief to the birds' feet. Tree branches are also suitable, easily obtained and because of the round shape, provide a perch where the bird is not sitting on the ball of the foot, which again we believe is of some assistance in the elimination or prevention of foot problems. We have also used swinging tree branch perches particularly for larger birds such as the Gyrfalcons, and although these are suitable, they have their limitations and are difficult to suspend properly.

Any discussion of perches inevitably comes back to the question of foot problems and generally I can only say we have had very few foot problems. Curiously the majority of these problems with us have been with Peregrines and not with Gyrfalcons or Merlins which have so traditionally been prone to foot problems. For the most part, we have been able to solve foot swellings by provision of alternate perches although in cases where a corn was involved, we have had to go to minor surgery.

It is our observation that the choice of location of perches is very important and that three basic considerations should be met; i.e., (a) they should provide security for the birds (height with large falcons) (b) there should be provision

for the female to perch near the nest ledge prior to egg laying and (c) perches should be situated so that any attempt at mating would not be thwarted by the location (e.g. closeness of the perch to the ceiling). We have attempted to provide two or three perches near each nest ledge, one adjacent to the ledge and two to one side or the other and also a perch across the mouth of the nesting ledge itself. We have found that the birds appear to prefer to eat on straw bales or a flat surface of this nature, and will carry their food to straw bales or a flat ledge for plucking and eating. High perches at or near windows are designed to provide an element of security and at the same time allow the birds to spend a good deal of time in the sun.

Blind. If you wish to know what is happening and unless you have very tame birds, the provision of a blind or a suitable viewing area is absolutely essential in establishing new breeding pairs of birds. Although the benefits are described in some detail in the section on behavior, it is worth indication that a blind should have the following features. First it should provide you with the opportunity to approach and observe the birds without being seen by them so that they will not be disturbed nor aware of your presence. We have also found that blinds provide suitable opportunity for recording and photography; however, if this is going to be done, the holes and photoports should be provided well in advance so that the birds will not be disturbed when they are used. Blinds should be large and comfortable enough to provide an opportunity to sit and observe for a considerable period of time without discomfort. We have found one-way mirrors allow optimum viewing provided they are not situated so that the bird is not looking at itself in the mirror. The mirrors should be removable so that they can be kept clean and should be large enough to provide adequate viewing and possibly photography if you so desire. The inside of the blind should be dark as you need a two to one differential in light between the inside and the outside of the blind so that the mirrors function properly. And finally, you should not smoke or, that is, have a lighted cigarette or any bright object such as a match, lighter, flashlight or anything that would reflect light immediately behind the mirrors as this is readily observable and will upset the birds. If you are in a cool climate, the blind should also be provided with some ventilation and possibly a fan so that in the early spring the mirrors do not become covered with condensation. There has been some question as to disturbance due to the blind and I suggest that the birds will adjust readily to sound in most instances; therefore, the blind should be set up in such a way that it can be approached. However, once in use, a little bit of preliminary work, perhaps visiting the blind and moving around for a few minutes a day until the birds gradually get adjusted to it, the use of a radio in the blind turned on very quietly, or something of this type will help to adjust the birds to sound from the blind and they will soon become accustomed to this. One additional suggestion is simply that the blind be situated in such a way that you can look directly into the nest ledges and can therefore be in a position to determine whether the birds are laying or not. Your blinds should also allow you to keep the birds under observation in all areas of the pen so that it is possible to observe the various behavior patterns which might occur in one area or the other.

Floor Covering. The floor covering in all of our pens has been wheat straw. Although straw and hay are apparently considered taboo in some areas, we very much prefer wheat straw as it is clean, relatively dust free and since we are living in a very dry area, it is very easy to keep clean. We do not have problems with moldy material and straw is very suitable since it absorbs the droppings from the birds, is readily cleaned and is very inexpensive.

Perhaps we can now go into the questions. You will have noticed that we have described different types of housing and in checking the literature, it appears that most of the facilities were actually enclosed buildings or large outdoor cage type aviaries or a combination of the two.

SWARTZ. I might comment a little bit just to add to the data on some of these things. I have noticed the same sort of thing with Gyrfalcons which you mentioned with height and found that immediately when the bird had an opportunity of getting away and looking down he was much happier. I have subsequently built some additional quarters with this provision. Your comment on blinds also leads me to remark that for some years now I've had a closed circuit television but since I just use a domestic set, it has to compete with Porky Pig and other such things. So I propagate with R.F. (that qualified as closed circuit). This has been an elegant system and I have boxes in all the quarters that permit rotation of the camera and it's really much cheaper than you probably have thought. Merlins somewhat to my surprise have preferred the kestrel box sort of thing by and large. For somewhat over three years now I have been working with both the progeny of a ground nesting pair and a pair of birds atypical to the Alaskan situation which use an old Magpie nest. I have provided ground situations, ledge situations, ledge situations with overhanging roof and ultimately a giant gigantic chickadee box sort of arrangement made out of old blazo boxes (a wooden gasoline box with a hole cut in it) very much like a kestrel box with a slightly larger opening. As mentioned, it appears that they have preferred the kestrel box sort of thing.

VOICE. What do you mean by swinging perches?

FYFE. These are perches that are tethered from the roof. They are a branch or a trunk of a small tree tethered at either end by a rope so that when the bird lands on the perch it has a tendency to give. We have used these particularly with Gyrfalcons.

VOICE. What's the hypothesis behind the choice of this perch?

FYFE. This perch has been used to permit the birds to land without striking too hard. We have noticed that with Gyrfalcons in particular that they have a tendency to hit very hard when they land on perches and the idea behind the swinging perch is to lessen the shock and thereby prevent injury to the ball of the foot.

GOBEN. I have observations on height that is contrary to what you have in that my pair of Ferruginous Hawks have behaved very differently from the falcons. I had them in an outdoor aviary where they could go indoors and outdoors and they had a considerable height where they could get up and look down on the surrounding yard. That year I did not get anything and I removed the birds and the next spring I put them into a 4x6 cubicle and got fertile eggs.

EBERLY. Did you find any practices or were there any practices that could have influenced the preference of the ledges over the barrels, or did you pretty well arrange things so that there was enough variety?

FYFE. We have tried to arrange the ledges and barrels in such a way that they were all backed up to the wall at relatively the same height. In the largest pen where the Peale's were put up we had two ledges and one barrel. Of the two open ledges one was at the same height as the barrel and one was much lower. In the two nesting attempts these Peregrines used the two open ledges in preference to the barrel. The barrel was used just for stashing food.

STODDART. Are you trying to look for a formula which would be applicable to all raptors or individual species rather than for an individual bird? You seem to be paying a lot of attention to nest boxes or ledges to height and so forth.

FYFE. The thinking behind what we have been doing has been hopefully to find a formula for a given species, in this case for the Peregrine or for Prairie Falcons. The basic idea behind it is to provide security and a situation in which the birds were at ease. I fully realize that birds have different temperaments, but what we have tried to do is to provide them with as many situations as possible and to let them select the situation which they might prefer. We have tried to give them more than we felt was needed in the way of perches and ledges as mentioned, to let the birds select so that we might learn where the preferences may be.

STODDART. Are the birds you are working with from the same source? I would think that if you are trying to find a formula for a species, it would be necessary that all of the young you are working with and the parents would have to be from the same source with the same temperament, and so on. As for example, in the case of Jim Enderson's Prairie Falcons, I think that they would nest in almost anything although this might be a situation which would be very uncomfortable, birds whose history was different from Jim's birds. I personally think everybody seems to be paying too much attention to finding the secret whether it is a nest box, a ledge or height. I don't think that there is a secret and I think the solution lies directly in the birds' securities or insecurities and it will depend on the individual bird species.

FYFE. Basically, I think that I agree with you in that we are trying to make

provisions which will provide for the necessary security of the birds. We cannot tell by looking at a bird what its particular requirements may be; therefore, we have been trying to make as many provisions as possible and are letting the bird more or less select its own preferences.

HUNTER. I think that this poses a very interesting question and one which I had hoped someone would take on. It poses the ecological problem of whether or not an individual will choose the situation in which he grew up, or whether the choice of a site is innate. I think that someone perhaps in the position of Dr. Porter with his experience with kestrels might be able to add something along these lines.

HAMERSTROM. Perhaps in partial answer to the last question, I have found that two horned owls which I have came from different nest sites. One came from a stick nest and the other came from a hole nest. The female selected the stick nest and the male selected the hole nest. I have no owlets.

VOICE. Relative to the use of wire on the pens, have you had problems with the birds flying into the wire?

FYFE. Yes, to some extent we have, particularly with tiercels of all species and definitely with Merlins. When I was in Patuxent last year, I noticed that they had their Merlins in wire pens, I believe, weld wire in construction. However, they had put snow fencing on the outside of the pen and when I inquired they advised me that this kept the birds from flying directly into it. We have tried this with some of our Merlins and with Prairie Falcons and it definitely does help. They still fly into the wire, but they land feet first on it and they do not try to go head first into the wire and damage themselves accordingly. In the same regard, we have not observed any problems with the fylon covered areas.

HUNTER. I have one more question that I would like to ask and I don't know who to direct it to. Has anyone in the group had experience using snow fence on top and what happens when you have a heavy snowfall in such a situation?

SHULTZ. It gets quite heavy. The snow fencing is on wire with 2x4 supports and we haven't had any break-through to date. We have, however, gone out early in the morning and knocked snow off because we felt it does present a potential hazard.

CAMPBELL. I would like to ask Jim Weaver whether or why they use spotlights as opposed to floodlights at Cornell?

WEAVER. They are floodlights.

SHERROD. Also, a question related to the floodlights. Can you tell me what

the intensity would be?

WEAVER. I do not know what the exact intensity would be. We are primarily giving them a good source of light and are not worried about intensity.

LAWSON. Is there any reason why everybody wants to use anything besides artificial light? Why is there this common bond to give them some sort of natural lighting; what is the reason behind it? Someone suggested vitamin D. Do you mean from a supplement?

VOICE. Yes.

VOICE. I question how much value we are going to get from sunlight through this opaque material since it cuts out all the ultraviolet light.

SHULTZ. Several of us have built pens with opaque or plywood walls with screened or snow fence tops. My facility is staggered down a hillside with a 4½ foot difference between the uphill and bottom hillside. It is built with plywood walls so that the bird has no visibility of dogs, children and so forth from the outside and the top is screened with snow fence. We have never had our birds fly into the wire at the top. They have all the sunlight in the world and they can see the blue sky and trees. They seem to be extremely happy in this situation and are comfortable.

SWARTZ. A comment on your point. In contrast, I have not made any effort to use natural light and this is dictated in part by the fact that I've got 50 to 60 degree below winter to get through in Alaska. The more windows I have, the more troubles I have. To date I have not got eggs, but in other respects I feel that I am getting complete response out of incandescent light as the sole source of illumination. To this point I have not considered that there is any super unique magic in any particular wave lengths of light. Although talking with Joe Simonyi shakes my confidence a little. I was clearly within three or four days of laying with my Merlins just a few weeks ago (judging from follicle size) when disaster struck. And that's total incandescent light in a converted coal bin.

STODDART. With regard to artificial light I still think that it might work well with birds taken out of the wild specifically for breeding. That is, if they were kept under artificial light for three or four years. I have tried it on old falconry birds because I thought it would really enhance their environment. In this regard I have done it with two Peregrines and a Prairie; all of these birds were old, the youngest being four years when I put him under artificial light. The birds' condition dropped. The weight didn't drop because I adjusted this, but the birds lost feather bloom so when I put the birds up to mate I didn't consider total artificial light, but this year we are going to have artificial light as supplement. I think for a bird who is three or four or seven years old that has been weathered using falconry methods and is stuck under artificial lights as I have

done three times, that it may be an emotional strain on them. They don't feel right and they don't preen enough and so forth. You know if your bird is losing bloom, when it's baby bloom in the first place, you know something is the matter. Maybe an imprint Peregrine or something that was used to the lights all of the time would compensate for it. But it has adverse effects on a bird that is used to being weathered.

FYFE. I would just like to make one comment in relation to light. We have stayed with natural lighting because we are at the same latitude as the majority of the birds we are dealing with and we felt that in this manner we were in a position to provide them with their natural photoperiod.

HUNT. We should keep in mind that day length is only one cue that birds receive from the environment. There is also the position of the sun, the stars and the moon and I would think that when in doubt, we would be best advised to use natural light.

FYFE. A final note which may be of interest is that as mentioned we are at the same latitude as the wild birds we are dealing with and in our case, both the Peregrines and the Prairies were laying at the same time as the wild birds.