

# Lighting Requirements for Indoor Breeding

Steven P. Hartman, Sunbury, OH

Most often light is considered to be a vehicle to make our environment visible. As an indoor parrot breeder, I find it necessary to think of light in much broader terms. The consequences of the sun's radiation is greater than that portion of the electromagnetic field produced by the sun that we can see with our eyes. In addition to the visible products of the sun, we also need to understand the contributions of low frequency infrared waves, high frequency ultraviolet waves, and all of the consequential effects the sun would have on our birds.

Understanding my own limitations when it came to developing a lighting program for my aviary, I began by sorting out the ways I see light and the effect I believe light has on the environment and the diurnal clock of our birds.

## ULTRAVIOLET

My studies have taught me that the Ultraviolet and Infrared radiation portion of light is probably the most overlooked spectrum of the sun's radiation in an indoor aviary. The three most important consequences of Ultraviolet radiation in the environment are disinfection, vitamin D synthesis and the psychological well being of the birds.

• Of the mentioned "interesting attempts at solution" in this article, I would request from Donna a letter clarifying which worked and which did not. I have heard of positive results with acupuncture, for example; and chamomile teas are used as calming agents. What other potential cures did the survey suggest?

• When the survey responses for the most part "zeroed each other out," it might be necessary to begin species-specific investigation. (In fact, this might be one of the areas of focus for a second, more in-depth survey to follow). Feather plucking in Senegals is not always equivalent to that in Budgies or macaws. What is important, is that any and every successful treatment be documented, catalogued and made available to others keeping parrots of the same species. A feather-plucking network of instant reference access for bird owners would also be a logical next step.

• It is true there are many feather-picking psittacines which live with psittacines native to another continent. (It is all too true that pet owners seem to want one of each vastly different birds, rather than four types of macaws, etc.) But there are also thousands of non-plucking parrots living in situations with other parrots from different continents. We have successfully raised macaws with cockatoos, Amazons with Greys, lorikeets with *Brotogeris*, and conures with *Poicephalus*, to name a few. I believe it is not the fact that the parrots are different in vocalization and mannerism which matters most, but how they are introduced and subsequently kept. Some pet owners unknowingly favor the newest bird in the household (especially if it is a baby). This has devastating effects upon the emotional health of a former favorite.

In addition, I have seen literally hundreds of feather-picking parrots kept with another bird or birds from their own continent. Even same species will manifest plucking in one or more of the birds. Greys kept together, cockatoos, macaws, conures, lories, Cockatiels, Hawk-headed, Capes, Amazons, and on and on.

To suggest that prospective pet buyers not purchase psittacines from the

same original continent on the basis of the statistics of this survey is probably premature and in the realm of conjecture. I believe *kind* of species is much less important to normal health of parrots kept in the same space than is *depth of their friendship* one to another.

We have a totally naked Blue-crowned conure case where the conure was housed with a Blue and Gold Macaw. Dominance by the larger bird was out of balance for years resulting in the conure's self-mutilation.

• Finally, I note that Donna has truly hit upon something with her African Grey/Orange-winged Amazon relationship. As she mentioned to our readers, when this kind of plucking motive is discovered, it is best to move the parrots to different rooms.

Two of her rejected reasons for the Grey plucking may be elaborated upon: One—sexual frustration. A sexually mature plucking parrot does not necessarily show any interest whatsoever in breeding. Certain dysfunctional psittacines do not know *what* they need to make themselves happy—minus a flock of their own species, they have no way to learn such. Close companionship in parrots (just as in humans) is not always sexual. That is why so many hookbills bond for life.

Secondly, boredom. All the larger cages, multitudes of toys, radio, TV, and households of humans in the whole world are not always enough to stave off birdie boredom, especially in the more intelligent and spontaneous species. These creatures we keep are still wild, exotic animals. I know, for I have seen, how much a domesticated parrot can crave the rain and wind on its feathers, a night out in the trees under the moonlight, or an open sky above and the air beneath its wings!!! Feather plucking is a complex, multifaceted problem. Like fingernail biting and teeth grinding in humans, there are often hidden underlying causes. In all cases I have successfully treated, the one surefire remedy was change. Change that reduced the stress causing the nervous, abnormal habit.

So good luck to those of you also working on this enigma. Keep those surveys coming! We parrot lovers thank you.

Mahalo nui loa, *Eb Crauens* ➤

Since we do the cleaning in the aviary and a good diet has adequate vitamins, we can be less concerned with UV light for these purposes but there is conclusive evidence that the UV component of light is necessary for the overall health of animals. Standard fluorescent tubes generally emit little or no infrared light and a very small amount of ultraviolet light.

### **INCANDESCENT**

Conversely, incandescent bulbs generate a great deal of infrared light and do not emit any light in the ultraviolet wavelengths. This infrared light produced by incandescent bulbs creates a quantity of heat that may need to be factored into your management program. Infrared can be a benefit if you raise plants in your aviary as I do.

### **MEASURING QUANTITIES OF LIGHT**

Quantities of light can be measured with a light meter. Outside on a sunny day a light meter would register in the neighborhood of 10,000 footcandles of light. The overall quantity of light in my aviaries rarely exceeds 1500 footcandles in front of the cages and is as low as 500 footcandles in the rear of the cage. Lightmeters are similar in scope to a battery tester. Instead of touching the battery to electrodes there is a small window to allow light to enter. The light is measured by the amount of electromagnetic energy entering the window. This energy level is then displayed by a needle which rises to the appropriate calibration mark on the grid. Quantities but not the quality of light can be measured with a light meter. Our goal is not to duplicate sunlight but to replicate as best as possible the portions of the sun's radiation or the consequences of exposure to sunlight, sufficient to achieve our goals of maintaining a healthy and productive flock.

### **REPLICATING SUNLIGHT'S IMPACT**

For purposes of replicating sunlight's impact on my environment and the photoperiodism of my birds, I have taken into consideration the following:

**First: I looked at the obvious.** How accurately does my lighting replicate the colors. If the colors are similar to what the sun would produce then I feel I am at least on the right track. If all of the visible wavelengths are proportionally represented in my environment, then I can more confidently assume that the consequences of lighting which I have not been able to quantify or qualify are also being duplicated as well.

**Second: What is the psychological impact of light?** Are the birds acting happy, breeding well, remaining healthy? Within a limited time frame (10 years) this is one of the most difficult aspects to get a handle on. I have had breeding successes and failures with healthy breeding stock both indoors and outdoors. There are a multitude of factors involved in a high density indoor breeding facility that it would take many years of not changing any of the other environmental factors to determine these parameters. In this relatively new industry there is not yet enough known about the factors that influence reproduction to accurately test this on large parrots. However there is a great deal of information known about the productivity of humans, animals and plants involving standard lighting verses full spectrum lighting. As an example, it has been shown that students consistently score higher grades when schools switched to a full spectrum lighting system.

**Third: What impact does the length of daylight have** on activity level and reproductive urges? Most of the parrots I raise originated from somewhere between the Tropic of Capricorn and the Tropic of Cancer. Between these two points of latitude the seasonal day length varies much less than it does in Ohio.

None the less, in captivity, we see differences in activity level and reproduction with different day lengths. My observations point to the short day length as being the most important light-induced cue regarding reproduction. I believe this to be the case since

the birds initiate their mating rituals and nest building habits as a response to the incremental increases in day length. Therefore, without a prior shorter day length you can not have a response to a greater day length.

There are habits that occur as the day cycle lengthens, but these habits of the male feeding the female, the female spending more time in the box and the subsequent egg laying appear to be a response to the behaviors started while the day length is shorter. It has been shown in other birds that after a breeding period they will become nonresponsive to photostimulation and it is necessary for the short day lengths to reactivate the photoreceptive system.

### **LIGHT AND HORMONES**

In poultry and other birds the increased day length is detected by receptors in the retina of the eyes. Nerve impulses from the retina signal neurosecretory cells in the hypothalamus. The hypothalamus then secretes hormones that cause the production of gonadotropic hormones. As the gonads increase in size a whole host of chemical reactions occur to create what we call breeding behavior. (UV light is very important here).

Now, just in case the diurnal clocks of both mates are out of sync., pheromones are produced by both sexes to help synchronize their passions.

Additionally I have noticed activity levels are greater during periods of long day lengths. Toys are played with (destroyed) with more vigor. Vocalizations also seem to be more varied, intense and lingering in the evening hours. The social status of males over females and of birds in neighboring cages tends to become more aggressive as the daylight increases.

Up to this point we have discussed theory and observation. The following will describe how we have put these lighting concepts into practice.

Four levels of lighting are used to simulate the changes in sunrise, sunset and relative density of the natural light sequence occurring during a 24 hour

cycle. Full spectrum (VitaLite) fluorescent lighting is used in all areas for the daylight. Incandescent bulbs (regular light bulbs) are used for sunrise, sunset and moonlight.

### VITALITE FLUORESCENT BASE

I have chosen VitaLite fluorescent lighting as the base of my system for several reasons. In general, fluorescent lights are less expensive to operate than incandescent bulbs. Incandescent bulbs give off much more heat which is expensive to eliminate in the summer. And, within a fluorescent tube it is possible to create a mixture of many phosphors which will closely replicate the visual spectrum of sunlight.

As already stated, I am not exactly sure how much the VitaLites contribute to contentment of the birds or increased production but I use them because of the large body of positive evidence from other human and animal research. Therefore, important reasons to choose fluorescent lighting is the lower overall operating cost, better ability to duplicate the wavelength balance of natural light and its excellent distribution qualities.

### TIMERS & PHOTO SENSITIVE SWITCHES

Inexpensive timers and photo sensitive switches are used to regulate the sequence of lighting. Any electrical supply house or hardware store will have all of the photo sensitive switches and timers necessary. The main fluorescent lighting is regulated by a high capacity timing switch capable of handling in excess of 50 tubes.

Incandescent lights which come on

for a short period before and after the VitaLites, are controlled by small inexpensive home lamp timers. These incandescent light are installed into photo activated switches that screw into the socket before the bulb. Moonlight is created by small 7.5-watt photo activated night lights which turn on automatically when all other lights turn off.

### SETTING DAWN AND DUSK

Here's how it works. First, set the fluorescent (VitaLite) timer to come on and go off when desired. (Example: on at 7 A.M./off at 7 P.M.)

Second, set the incandescent timer to come on 10 minutes before and go off 20 minutes after the fluorescent bulbs. This will provide a twilight and dusk period. (Example: On at 6:50 A.M. /off at 7:20 P.M.) When the VitaLites turn on, the incandescent lights will automatically turn off because of the photo switch the bulb is screwed into. (Therefore, the incandescent lights in our example would be on at 6:50 A.M. /off at 7:00 A.M., on at 7:00 P.M. / off at 7:20 P.M.) When the incandescent (twilight) turn on, the small 7.5-watt photo controlled night lights (moon light) automatically turn off.

For a 400 square foot room I use at least 16 40-watt fluorescent tubes, two 60-watt incandescent and two 7.5-watt night lights. All lights are installed on the ceiling in front of the cages. This placement allows for a bright area in the front of the cage and a darker area in the rear. Nest boxes are placed so that the least amount of light will illuminate the interior. Any nest box on the front of a cage has the entrance facing the rear to keep out light.

### MANIPULATING THE ENVIRONMENT

At Hartman Aviary we try to advance, enhance and shorten the natural sequences of the environment to aid in reproduction. The greatest reason for this schedule is to try and encourage birds to breed that may *not* breed on a less severe program. By shortening the day length to 10 hours and lengthening them to 15.5 hours we have a greater impact on the breeders.

Normally they would be subject to 12 (minimum) to 14 (maximum) hour day lengths in the wild. With many of the parameters for breeding yet to be discovered, a 10 hour day is generally a definitive NO to breeding and a 15.5 hour day allows more time for courtship.

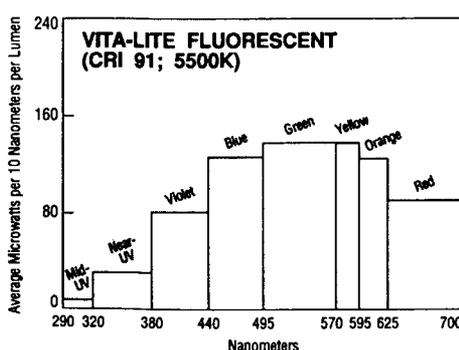
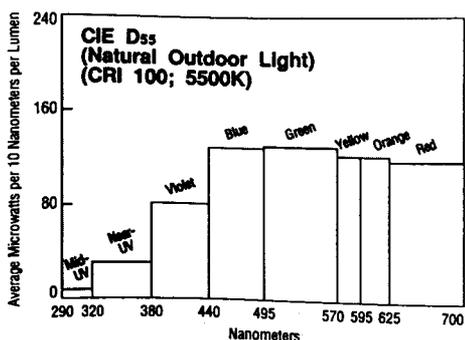
Having babies earlier in the season is another advantage to advancing reproduction. We always have a waiting list before we have babies but seldom have one at the end of the breeding season.

### REDUCING COSTS

Reduced heating and cooling costs are the third advantage to advancing the breeding season. Lights produce heat, and at the end of the summer when we shorten our days we are also cooling the buildings by moving air with ventilators. So less light means less heat and less expense. Conversely, in winter when our heating bill is the highest some of the heat is coming from the lights which are on longer at that time.

My current program calls for the shortest day length to last about two months. The increase from 10 hours to 15.5 is done in increments of one hour over a two month period. Egg production will generally occur about one month after the long day is achieved. By pulling babies at two weeks we can usually produce at least three clutches in the following six months.

It should be noted that a few stubborn birds could not care less what I do with the lights, timers, switches, photocells and different levels of lighting and will not breed at all while others will give me six or seven clutches a year just to confuse me. ➔



Color Rendering Index (CRI) is critical to duplicating natural sunlight. VITA-LITE bulbs are 91% accurate, while most other standard lighting is in the 50-70% range.