CRAWFORD H. GREENEWALT
DU PONT BUILDING
WILMINGTON, DELAWARE

December 27, 1960

Mr. Eliot Porter
Route 4, Box 33
Santa Fe, New Mexico

Dear Mr. Porter:

I shall treasure particularly your kind words about my HUMMINGBIRD book since, coming from you, they have more meaning than any of the other congratulatory letters I have received. I have always admired your own bird photographs tremendously; in fact I have billed you on a number of occasions as the most accomplished bird photographer living. It may amuse you to know that I went through the Amadon-Murphy book and was able to pick out your pictures simply by their quality and without reference to the index in the back.

Of course I will be delighted to help you in your project in any way I can but I think perhaps before attempting to answer your questions in detail I had better give a little more background than I was able to give in the book itself. I think the most useful thing with respect to the electronic flash units is to send you the attached reprint from the National Geographic Magazine simply because on page 664 there is a picture which shows the strobe units and the lamps in addition to the motor-driven Hasselblad. I should say first of all that the strobe unit built into a Halliburton aluminum suitcase is not an article of commerce and has to be specially built. The technician at the Du Pont Experimental Station who built and developed mine for me has agreed to build two for an interested friend at a charge of $800 each. This, I think you will agree, is a pretty stiff price and warranted only because they are built by hand. I think the first question

you should decide is whether the compactness and convenience is worth that price over and above your own units.

There are two aspects of the strobe units which are somewhat unusual. First of all there is the arrangement that gives an extremely short flash duration. What this amounts to is the use of an FT-218 flash tube designed for 900 volts and hence with a very low resistance. It can be operated at 2500 volts by the addition of a choke coil which limits the current at the initial part of the discharge. The flash duration comes out to about 30 microseconds and the lamps are good for not more than 1,000 flashes. If one uses FT-220s, the flash duration is about double, viz., 65 microseconds, and the lamps last indefinitely. I suspect that the capacitors which supply the power for the lamps are not too different from your own. They are 2500-volt 14-microfarad capacitors supplied by General Electric and I use three of them, one for each lamp.

The other unusual feature arises out of my desire to limit to an absolute minimum the idling current for the strobe unit. This comprises the following features: (1) a special high-efficiency transformer to go from 6 volts AC to 2500 volts AC, and (2) the use of silicon rectifiers to go from 2500 volts AC to 2500 volts DC with negligible current consumption. Finally, there is an automatic switching device which turns off the battery when the voltage reaches 2500 volts and turns it on again when the voltage drops to 2300 volts. As a result of all of these features I can use a five-cell nickel-cadmium battery of 10 ampere-hour capacity weighing about 7 pounds. This enables me to run the strobe units continuously for 8 hours and get perhaps as many as 250 to 300 flashes. This turned out to be quite an important feature when working in South America, where batteries frequently had to be charged

by plugging them into an automobile battery since 115 volts, 60 cycles was just not available.

What I think you will have to decide for yourself is whether these features are worth the cost. For me they were. But if you need more light than my units will give you will have to use two or three of them and this, with the three lamps per unit, may be more of a nuisance than it is worth.

I have a wiring diagram of these electronic flash units which I will be glad to send you, but unfortunately the wiring diagram says nothing about how they are assembled. The photograph in the Geographic shows the setup reasonably well but of course should you ever be in the east I would be delighted to meet you and show you everything I have.

As to the device used for triggering the camera either manually or from the photocell, this in its current version is extremely compact, contained in a box perhaps 6" long by 2" high by 3" wide and operated from two 25-volt hearing aid batteries. You cannot see the box in the Geographic picture but you can see the photocell opposite the rosette of the feeder. The control circuit is fully transistorized, which accounts for its small size and low current consumption. The only additional items one needs are the photocell, cords to connect the control box to the photocell and to the solenoid on the camera, and a long cord on a reel to permit you to stay at a distance when the photographs are taken. The control box is so arranged that one may either energize the photocell circuit to allow the bird to take its own picture, or one can trigger the camera manually without the photocell circuit. The control box I am afraid is also a special item and might cost a couple of hundred dollars if one were built specially. I have a wiring diagram of this also which I will be glad to send you.

We come finally to the motor-driven camera and, here, whether I can be helpful or not depends, I think, entirely on whether or not you would be willing to go to roll film in a 2-1/2" square format. I have been using a modified Hasselblad camera body and have disconnected the focal plane shutter and contrived a motor drive which has the sole purpose of transporting the film. I use a lens with a compur shutter but everything has been removed from the compur shutter with the exception of the bulb setting. A solenoid in the cable release opening is provided with a pulse from a capacitor and a suitable voltage which produces a stroke on the solenoid just great enough to open the shutter, to close the electronic flash contacts in the shutter. The pulse is dissipated when these operations are finished and the spring in the shutter returns the solenoid to its original position. This device, conceived originally by Harold Edgerton, makes it unnecessary to recock the shutter after each exposure. There is also a contact device which energizes the motor as soon as the strobe contacts are made so that one does not have to energize the motor remotely.

The great virtue of remote film transport is that one does not have to go to the camera after each exposure. With hummingbirds this is not important since they are tame enough, or bold enough as the case may be, to tolerate a person quite close to the camera. For nesting birds, however, the ability to transport film and reset the shutter remotely would multiply the pictures taken in a given time interval by at least a factor of two, inasmuch as the birds soon get used to the flash but they never get used to the photographer rushing up to the camera after each picture is taken.

I gather from your letter that you use a larger film format, viz., 4 x 5" Ektachrome, and

with any camera I have seen it would take quite a bit of doing to arrange a remotely operated film transport. I don't say that it is impossible, since nothing these days is impossible, but I have solved the problem only for the Hasselblad.

If, however, the Hasselblad idea should appeal to you, there is likely to be available soon a much simpler solution than the one I use. I know Victor Hasselblad quite well and he is bringing out soon a motor-operated box for his Hasselblad-C. If this works out well, your problem is reduced to buying a Hasselblad with the motor-driven box and simply adapting a solenoid for triggering it. That would be an extremely simple task.

I am sorry to have been so long-winded but I thought before letting you in for a lot of money that you ought to know what the score is and what you can and cannot do with the equipment I have developed. I might add also that a little conversation is worth dozens of letters and if you have any plans at all to be in the east, let me know and I can show you not only everything I have but, what is probably better, I can introduce you to the extremely competent electronics people who have developed my equipment for me. If, on the other hand, you would like to look at wiring diagrams, say the word and I will send them along.

Sincerely,

CHG:NBS