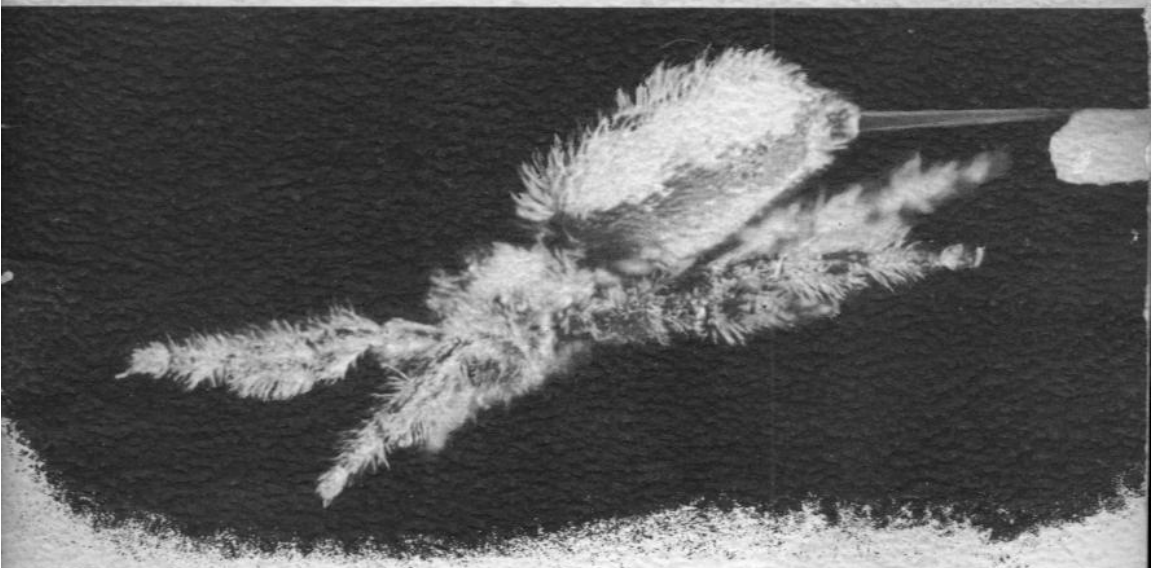
MUSEUM PICTORIAL

NUMBER 5



NATURE PHOTOGRAPHY

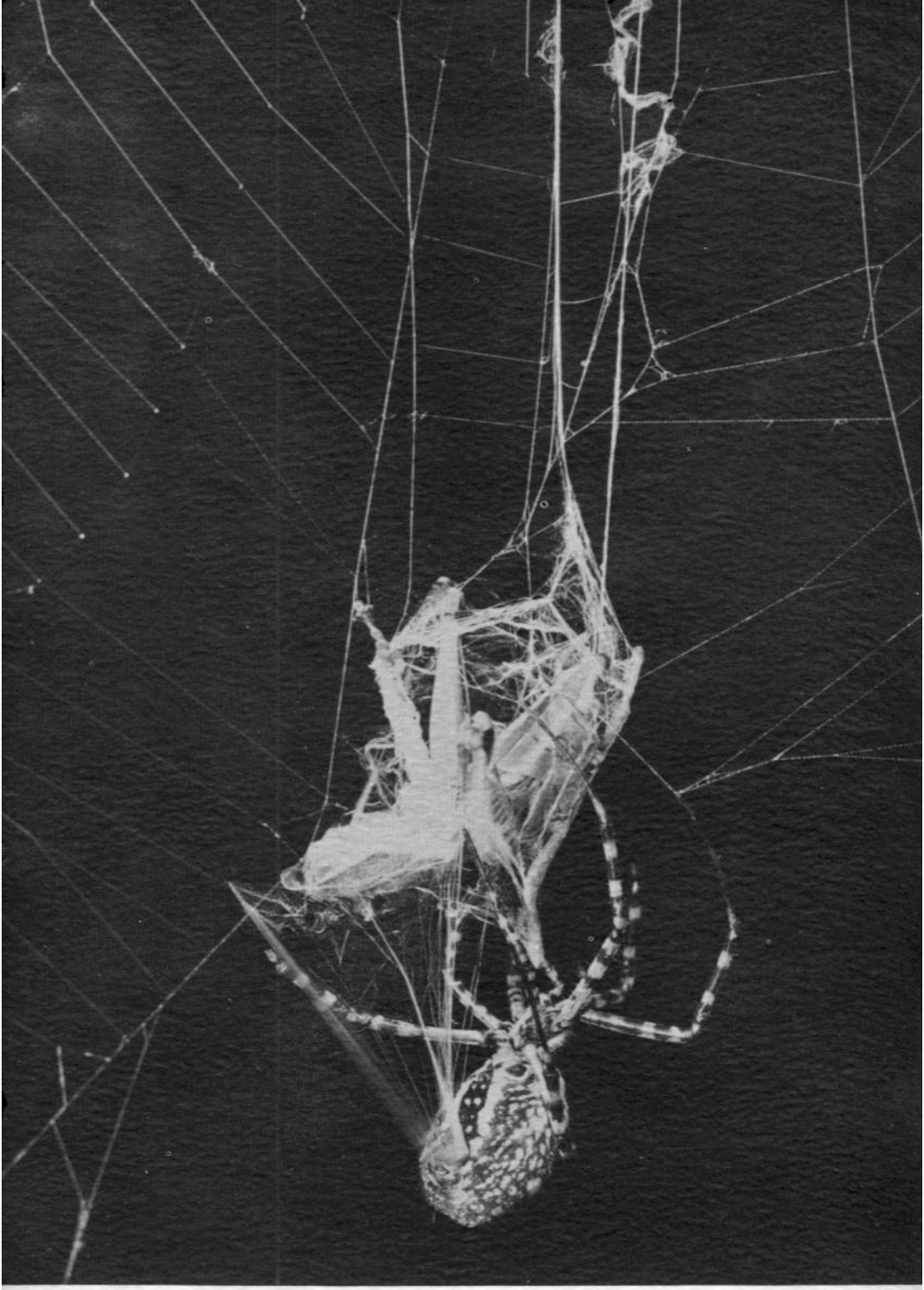
with the

HIGH-SPEED FLASH

by

WALKER VAN RIPER, ROBERT J. NIEDRACH
and ALFRED M. BAILEY

DENVER MUSEUM OF NATURAL HISTORY
CITY PARK DENVER, COLORADO



BANDED GARDEN SPIDER, *Argiope trifasciata,* wrapping up her prey, a large grasshopper. The spray of wrapping filaments issues from the spinnerets and is manipulated by the hind legs, the forelegs turning the prey over and over.

FOREWORD

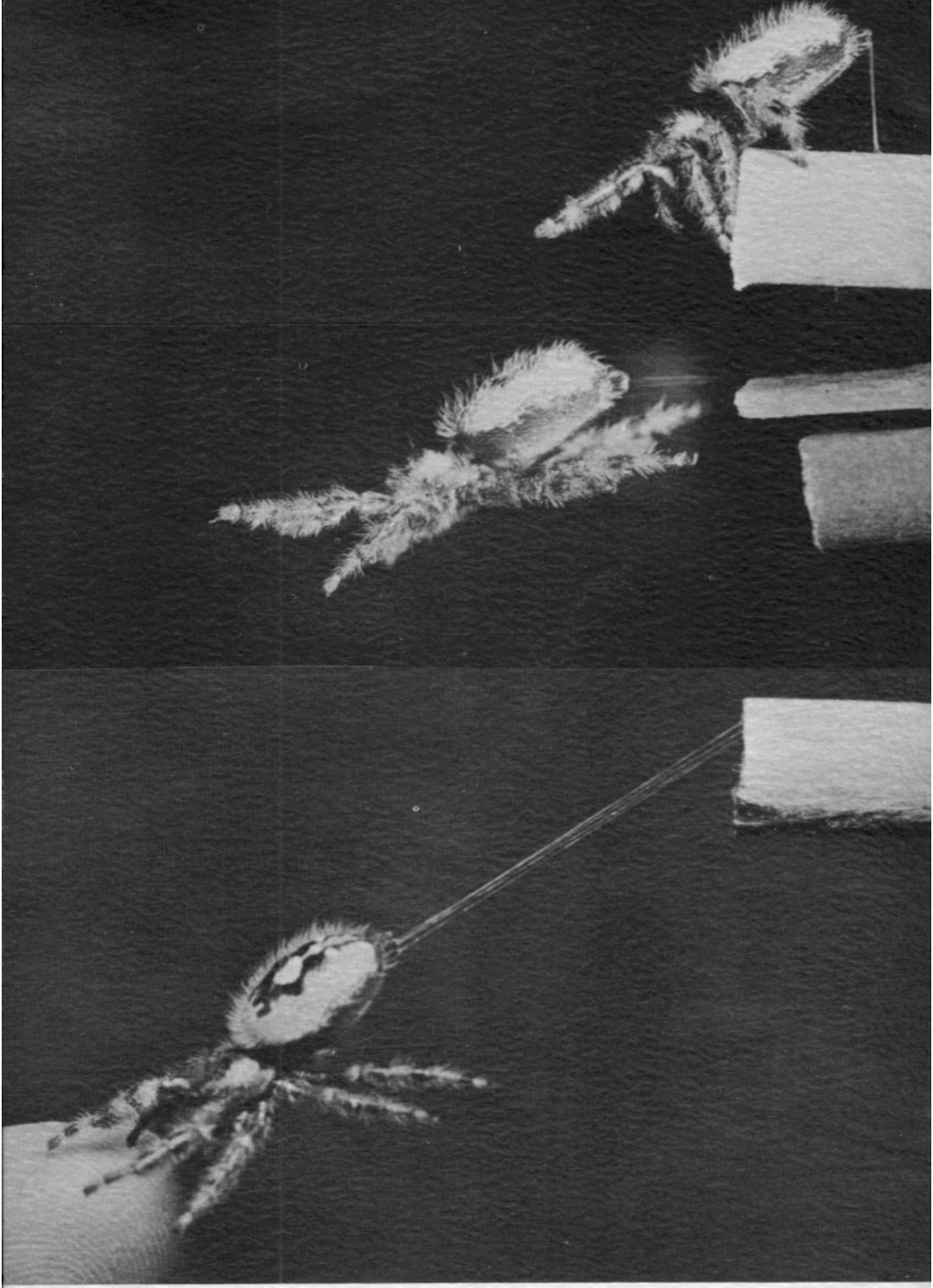
The development of the high-speed flash which makes it possible to stop all apparent motion in fast-moving objects has opened a new field to the nature photographer. The open flash, cartridge, and bulb have been used extensively in the past, but now light many times brighter than the sun can be thrown for a brief part of a second upon the intended photographic subject. The development of the equipment by Dr. Harold E. Edgerton of Massachusetts Institute of Technology is told briefly in the following pages, and the experiences of the authors and the type of equipment used in securing pictures of animal life from the lowest forms to the highest vertebrates are given in some detail. Walker Van Riper, Curator of the Department of Insects and Spiders of this Museum, has experimented widely and has been in close consultation with Dr. Edgerton.

The following notes fall into two parts. Mr. Van Riper and Robert J. Niedrach, Curator of Birds, have prepared Part I covering the high-speed flash and its application to nature photography; they have explained many of the problems involved, giving a short historical account of the development of equipment, and have reported in detail some of their experiences in this interesting field.

Part II is my rather meager contribution. I am typical of the many nature enthusiasts who know little about the mechanics of cameras and accessories—who desire aids to good photography and, through trial and error, hope to secure worthwhile results. Consequently the last part of this MUSEUM PICTORIAL is a narrative of my experiences in making pictures of birds and mammals with miniature cameras equipped with focal plane shutters. Until recently such shutters have not been suitable for speed work, but the new Exakta V and the newer model Exakta VX have proved excellent for the purpose. The single lens reflex cameras have always been my favorites for making wild life pictures, and I believe that the many advantages of 35 mm. over larger sizes make such machines ideal for photographing natural history subjects.

ALFRED M. BAILEY

Published June 1, 1952
Denver, Colorado



JUMPING SPIDER, *Phidippus audax,* in the act of jumping. 1/20,000 of a second, open-flash-close method. Illustrates use of the safety line.

Nature Photography with the High-Speed Flash

Part One

By Walker Van Riper and Robert J. Niedrach

Introduction

"A new picture world lies open and almost unexplored before the photographer who takes up speed-flash photography." So wrote Geoffrey Gilbert, the British authority on photography, a short time after the first American-made high-speed flash sets were available in England. We shall see, however, that this apparatus affords something more than a new and exciting picture-taking method, for it is also a highly useful scientific tool.

It is a new kind of artificial light—an electronic photographic flash hundreds of times brighter than sunlight and with a duration anywhere from 1/1000 of a second to less than 1/1,000,000 (one microsecond). It is completely under control, and so flexible and adaptable that it can be used successfully with any kind of camera, any lens, any type of shutter, any film. It can be set up to take a picture when the subject cuts an electric-eye beam, or makes a sound picked up by a microphone, or actuates a wide variety of delicate switches and triggers. Thus anything imaginable from flying bird to bullet can be made to take its own picture, and very often these pictures record things which are completely invisible to the human eye. Moreover, the photographer is made independent of daylight, and the risk of movement of subject or camera is completely done away with.

Plainly enough an instrument of this sort has enormous possibilities for the photography of any kind of living animal from those that are microscopic in size up to the largest; for the study of particular motions, such as flying, jumping, running, the strike of a rattlesnake, the action of a toad's tongue, the spinning work of the spider; for closeup portraits of birds and of other wild and domestic animals, and of spiders and insects; for wild flowers in color where it is a great advantage to be independent of daylight and of movements caused by the wind; for unposed and exciting pictures of people, children, pets; for sports and for many scientific observations.

The flash, in addition, has a wide field of usefulness in competition with other methods of picture taking. We have not been able

to reproduce in this publication examples of color photography with the high-speed flash, but it is our opinion, and this is backed by the experiences of specialists in a number of fields, that, within its range, better color pictures can be taken by means of the high-speed flash than by any other kind of lighting. The remarkable dependability of the flash, the fact that its color temperature does not vary with use, its virtual duplication of sunlight, its outstanding brilliancy account for this. The only restriction is that the subject must be close to the camera—within the range of the lights—the method, of course, not being applicable to landscapes or other subjects which are distant or of great size.

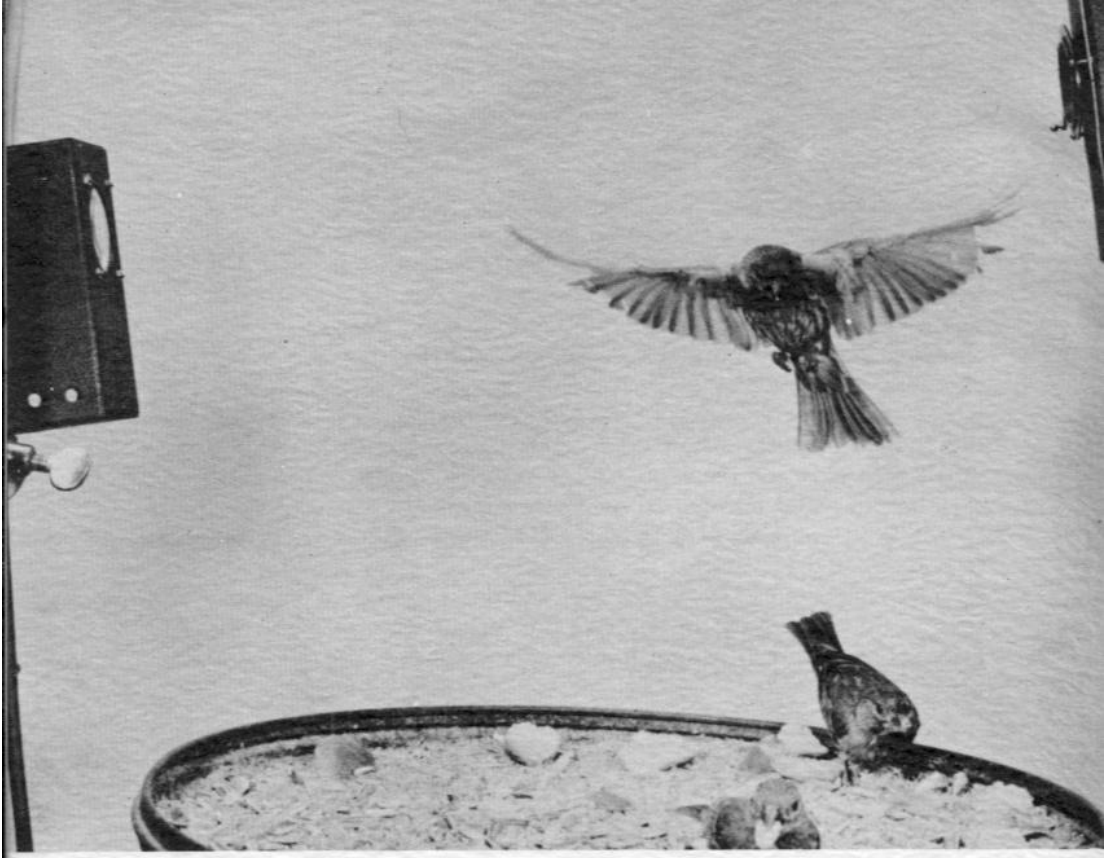
In comparison with the common flash bulb, the high-speed flash has some advantages and some disadvantages. The portable sets which we use require about the same guide number as the Press 25 bulb at 1/400, but the shorter exposure (1/5000) is better at stopping motion and at eliminating camera movement troubles. Many photog-

RAINBOW TROUT, *Salmo irideus,* takes its own picture, leaping out of the water at a fly dangling above—the fly being attached to a delicate switch controlling the camera and lights.

raphers prefer the quality of the high-speed flash. They say it is softer, has less tendency to burn up the foregrounds, and gives better rendition of dark hair, fur, and other textures which sometimes fall flat with flash bulbs. It is also much easier to test for synchronization, is easier on the eyes of subject and operator, does away with changing bulbs between shots, and costs much less per shot. The disadvantages are that the initial cost of a high-speed flash outfit is considerable, and it has some weight and bulk (pretty much in proportion to light output). Also there is more to go wrong than with the simple flash bulb and the photographer must go through a period of experimenting and learning to use the equipment.

It is the purpose of this issue of MUSEUM PICTORIAL to tell in non-technical terms what the high-speed flash is, to recite briefly its interesting history, to list the best additional sources of information on the subject, and to illustrate the various ways in which the flash has been used in natural history photography.

SET-UP for trout picture. Two high-speed flash sets taking power from car battery.



THE ELECTRIC EYE is one of the most useful and versatile devices for controlling and tripping the high-speed flash. In this example, the light source is at left, the photoelectric relay at right. When the flying house finch cuts the light beam, she sets off camera and lights and takes her own picture.

HISTORICAL

High-speed flash photography is so new that only a very small fraction of the total of picture-takers, amateur or professional, has had the interesting experience of becoming acquainted with this method. Strictly speaking, however, the idea is not a new one. In fact it dates back just a century to the "father of modern photography" himself—William Henry Fox Talbot. It was Talbot who first made a photograph on paper, first conceived the negative-to-positive procedure, produced the first book illustrated by photographs, and opened the first portrait studio. He was one of those brilliant amateurs like Darwin, Count Rumford, Leeuwenhoek, and many others who have made significant contributions to the advancement of science. Graduate of Cambridge, country gentleman, Member of Parliament, admitted to the Royal Society (not for his inventions in the field of photography, but for work in mathematics and chemistry), writer, etymologist, botanist, archaeologist—every field he cultivated was improved by his work.

A number of years after his pioneer inventions in photography, in fact in 1851, Fox Talbot staged a demonstration at the Royal Institution of a new photographic method. He attached a small piece of the LONDON TIMES to a rapidly whirling disk and took a picture of it in a darkened room with the flash of an electric spark. Every letter could be read.

HONEY-BEE collecting the first pollen of spring from pussy-willow. 1/20,000 of a second.

Talbot patented this invention and in the patent specifications claimed, "if this process is properly performed, a distinct positive image of the moving body will be seen upon the glass (plate), the rapidity of the motion not affecting the accuracy of the delineation." His expectations, however, about the future of his invention failed to materialize.

Following some experiments by Mach and others in Germany and France, Sir C. V. Boys, in the early nineties, made some successful pictures of rifle bullets in flight. The set-up employed the spark discharge from a Leyden jar (condenser), the bullet hitting a trigger which flashed the spark at the instant when the bullet passed between spark and camera, thus taking a silhouette picture of the bullet (and also, very interestingly, of the air waves produced by it). Some years afterwards, the late Fred W. Hart repeated this experiment here in Denver. The spark, however, proved to be too feeble a light for any but this very restricted photography.

The Invention

In 1931 Dr. Harold E. Edgerton, in connection with his work on electrical measurements at Massachusetts Institute of Technology, was studying a problem which he concluded might be clarified if he had a better form of stroboscope than the one then available. The stroboscope is an ancient device for creating the optical illusion that a moving object is standing still. If we have an electric fan rotating, say, at 18 revolutions per second, it will in ordinary light appear to the human eye as a flat, blurred disk, the blades of the fan being invisible. If, however, the fan is looked at under the light of a lamp which is made to flash 18 times per second, the fan will appear to be standing still and each blade will be visible. The same illusion can be created by looking at the fan through slits in a revolving disk when the disk is rotated at the proper speed. A disk, essentially of this sort, is in common use to check the speed of phonograph turntables.

What Dr. Edgerton required for his problem was a stroboscopic device which would employ flashes of light brilliant enough for photography (not possible previously) and with the flashing rate from low to exceedingly high and variable under exact control. The electronic apparatus which he constructed to meet these requirements not only achieved what he had in mind in an original and novel manner, but in the long run proved to be adaptable for many new uses and came to be recognized as a significant and highly important invention.

INVENTOR of the high-speed electronic flash, Dr. Harold E. Edgerton, Professor of Electrical Measurements, Massachusetts Institute of Technology.

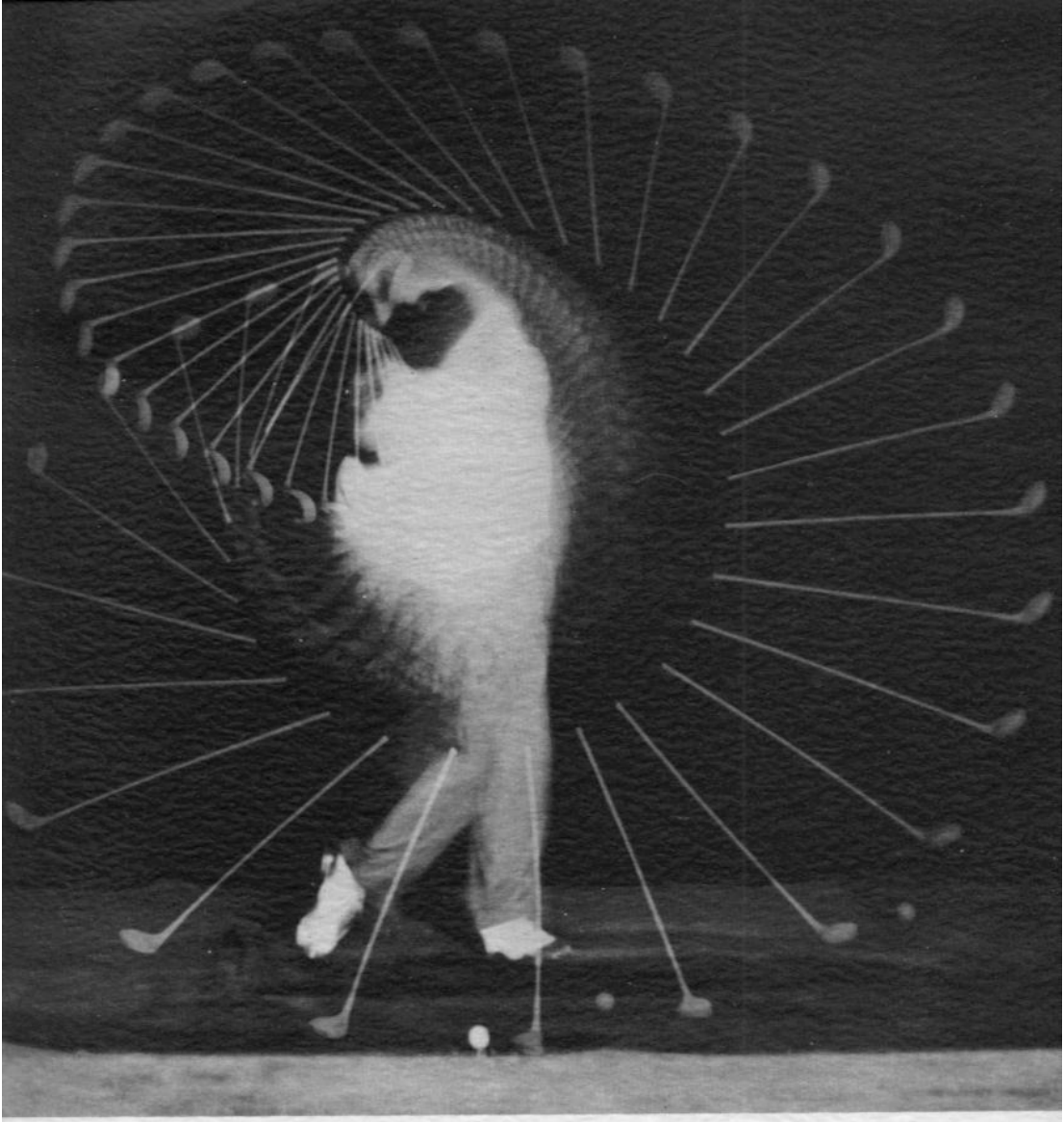
It, of course, found wide use in technical laboratories where it was used for the analytical study of all kinds of mechanical movements. But it also developed some very interesting and new photographic possibilities and it is these that are of interest here.

The most novel, perhaps, is the multiple exposure stroboscopic picture. This is taken by making a large number of successive flash exposures on a single film. The picture of Densmore Shute's golf swing which Dr. Edgerton has permitted us to reprint is an example. This was taken with 50 flashes each lasting 1/100,000 of a second and spaced at intervals of 1/100 of a second. This is truly "a still picture of motion". Dr. Edgerton and other photographers, particularly Gjon Mili whose stroboscopic pictures of dancers have been featured in LIFE, have made many interesting and informative experiments of this sort. The outfit necessary to produce the flashes required for this work is heavy, expensive, and takes a large power source. On a small scale something of the same sort may be done by flashing a number of independent flash units in succession at short intervals. This is a fascinating field of which we present an example in the picture of the hummingbird flying backwards.

Use of the stroboscopic light in motion picture photography required a new mechanism in the camera for moving the film, but, once this was done and an accurate synchronizing device invented, pictures could be taken at a far higher rate than had ever been possible before. The general principle employed is to draw the film past the camera lens in a smooth, continuous motion at a high rate of speed. The flashing light is so synchronized with this motion that a flash occurs every time the film moves the length of one frame. While the film is running the camera lens remains wide open as the character of the flashing light makes a shutter unnecessary.

In the early days of this invention Dr. Edgerton produced a film entitled "Seeing the Unseen" which has had an unusually wide circulation and still is being shown. Taken at high speed and projected at normal speed such a film slows up motion in a highly instructive and entertaining way. The shot of a hummingbird flying, for instance, produces a bird with a wing beat slower than a crow's or heron's.

Adaptation of the stroboscopic apparatus to produce a single flash synchronized with the camera shutter has proved to be the most valuable and widely used phase of this development, and it is the one with which we are chiefly concerned here. Obviously the single flash does not in any way employ the principle of the stroboscope. Nevertheless, because of the history of its development, it is often called a "stroboscopic light", or "strobe" for short. The trademarked name of one of the leading manufacturers—Strobo Research



DENSMORE SHUTE driving. Taken with the original stroboscopic, or repeating, flash, the duration of each being 1/100,000 of a second and the interval between flashes, 1/100 of a second. The modern single flash developed from the stroboscopic apparatus and for this reason is often called a "strobe" or "stroboscopic light". Picture by Dr. Edgerton.

of Milwaukee—is *Strob*. And that of the Heiland Research Corp. of Denver, is *Strobonar*. The English seem to prefer the term, "speed-lamp", and "speed-light" has been used in this country, in fact this is the title of one of the books referred to later.

Dr. Edgerton prefers "high-speed flash" or "high-speed electronic flash", and, as a general rule, we use the first of these terms.

In 1939 Dr. Edgerton and Dr. James R. Killian, Jr. (now president of M.I.T.), published a beautiful book, now long out of print, with the title FLASH. This book was profusely illustrated with pictures of a wide variety of subjects most of which would have been impossible to take with any previously known technique. Moreover, directions were given for building a high-speed flash unit and the vital parts were made available for the first time. Two new tubes were necessary—the straight flashtube and the "Strobotron", the invention of K. J. Germeshausen, one of Dr. Edgerton's associates. This is a "trigger tube" with the function of controlling and firing the flash. Also necessary was a special spark coil used in the trigger circuit. The remaining parts were standard radio items.

With the advice and assistance of the late Dr. Joyce C. Stearns, then professor of physics at the University of Denver, we built our first set. We are proud of the fact that this is still in use. It is cumbersome and heavy, weighing 55 pounds, but we can get a flash of 1/30,000 of a second with it (much faster than the modern apparatus) and we always use it where the highest speed is a requirement.

Soon after publication of FLASH a number of manufacturers began producing high-speed flash sets on a commercial basis and in the past ten years the device has come into wide use by photographers both in this country and abroad and great advances in design and usability of the equipment have been made.

Widespread recognition has been accorded Dr. Edgerton as the inventor of a highly valuable photographic technique. His honors include: National Prize Award of the American Institute of Electrical Engineers; Medal of the Royal Photographic Society, Potts Medal of the Franklin Institute; Modern Pioneer Award for Invention by the National Association of Manufacturers; Ninth Air Force "Freedom" Medal; Honorary Doctor of Engineering, University of Nebraska; Joseph A. Sprague Memorial Award of the National Press Photographers Association; U. S. Camera, Gold Medallion Achievement Award.

This last award, made in November, 1951, was "in recognition of his outstanding pioneer contributions in the field of high-speed flash photography." It is significant that, at this same time, a similar award was made to Dr. Gilbert Grosvenor, editor of NATIONAL

GEOGRAPHIC MAGAZINE, for "leadership in the widespread use of color photography editorially", for, from its inception Dr. Edgerton's development of the high-speed flash has had the encouragement and support of NATIONAL GEOGRAPHIC. His first hummingbird pictures in color appeared in that journal, as well as his remarkable circus pictures using the giant flash which he had developed for the Air Force for night reconnaissance photography, and the Arizona hummingbird pictures in which we, also, had a part. Many of Dr. Arthur A. Allen's color pictures of birds, made with the high-speed flash, first appeared in NATIONAL GEOGRAPHIC and recently were reprinted in a beautiful book, *Stalking Birds with Color Camera,* our Arizona hummingbirds and some other pictures also being included.

Equipment We Have Used

Our first high-speed flash unit was, as mentioned above, a home-made job built in 1939. This set derived its power from the house current, used the original Edgerton argon-filled flashtube, three General Electric Pyranol condensers with a total capacity of 45 microfarads charged to 1850 volts. Several years later another set following the same design was constructed on a gift for the purpose from the Colorado Yale Association to Walker Van Riper. We changed the flashtubes of these sets as improved kinds became available and they are now both equipped with the G. E. FT 220 sealed beam tube. For use in the workshop they are entirely satisfactory and many of our best pictures have been made with them.

For field use, however, they present some difficulties. They are bulky and heavy, weighing more than 50 pounds each, and they require a new power source in place of the house current. This is supplied by a converter which changes the 6 volts D.C. auto battery current to 110 volts A.C. with just enough output to run both units together. In use the converter is connected to the car battery at the car and a 110 volt A.C. line is run to the sets where they are in use. This is somewhat complicated and cumbersome. Nevertheless, we have obtained some good results, for example, the rising trout shown on page 6.

The Wabash-Sylvania portable "Electroflash" was our next acquisition. The power source for this set is two 2-volt storage batteries; the condenser capacity, 32 microfarads; the flashtube voltage, 2000 volts D.C. The flashtube and reflector are designed along the same lines and in about the same proportions as the ordinary photoflash gun. Total weight is about 14 pounds. This is a sturdy and well-designed set and it has proved to be of considerable value to us for use in the field.

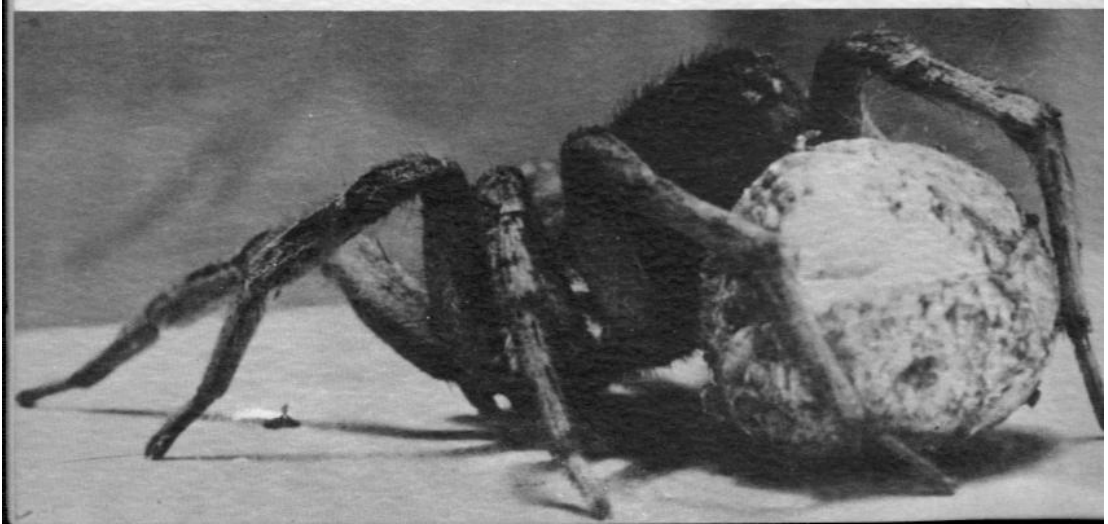
In 1950 the Museum obtained a Heiland "Strobonar", manufactured by the Heiland Research Corp. of Denver. This has been extensively used by Director Bailey with his Exakta camera and an account of his experiences will be found later on in this issue.

The Strobonar uses the new G.E. FT 110 U-tube and electrolytic condensers especially designed for portable sets of the lightest weight. It is made in two parts: the flash unit, and the power pack. For use in the studio, or wherever 110 volt A.C. current is available, the flash unit may be operated from that. For field use, the flash unit is plugged into the power pack. Both together weigh but 8 pounds. This set is a beautiful example of industrial designing. From that standpoint it is the best we have seen.

For the NATIONAL GEOGRAPHIC-DENVER MUSEUM OF NATURAL HISTORY Arizona expedition in 1950, Dr. Edgerton conceived the "Hummingbird Set" especially for natural history color photography in the field. This proved to be completely successful. Three sets were constructed in the M. I. T. Laboratories and, after use on the expedition, one set went to Dr. Edgerton, one to Dr. Arthur A. Allen of Cornell, and one to us.

Each set consists of three identical and independent units weighing about 8 pounds each. A unit is based on 6 volts D.C. from three 2-volt rechargeable, wet batteries in series, 180 mfd. total capacity of the condensers, and 950 volts D.C. produced for the G. E. FT 110 flashtube. Some idea of the light produced by this outfit may be obtained from the fact that we took most of our hummingbird color pictures at f.16 with an exposure time of about 1/5000 of a second on Daylight Kodachrome film. In bright Arizona sunlight with the same film the requirement would have been f.8 at 1/50 of a second. A simple calculation indicates, therefore, that for this particular photographic purpose, our lights were about 400 times brighter than sunlight.

WOLF SPIDER, *Lycosa coloradensis,* dragging her egg-sac, a characteristic of all the members of this large spider family.

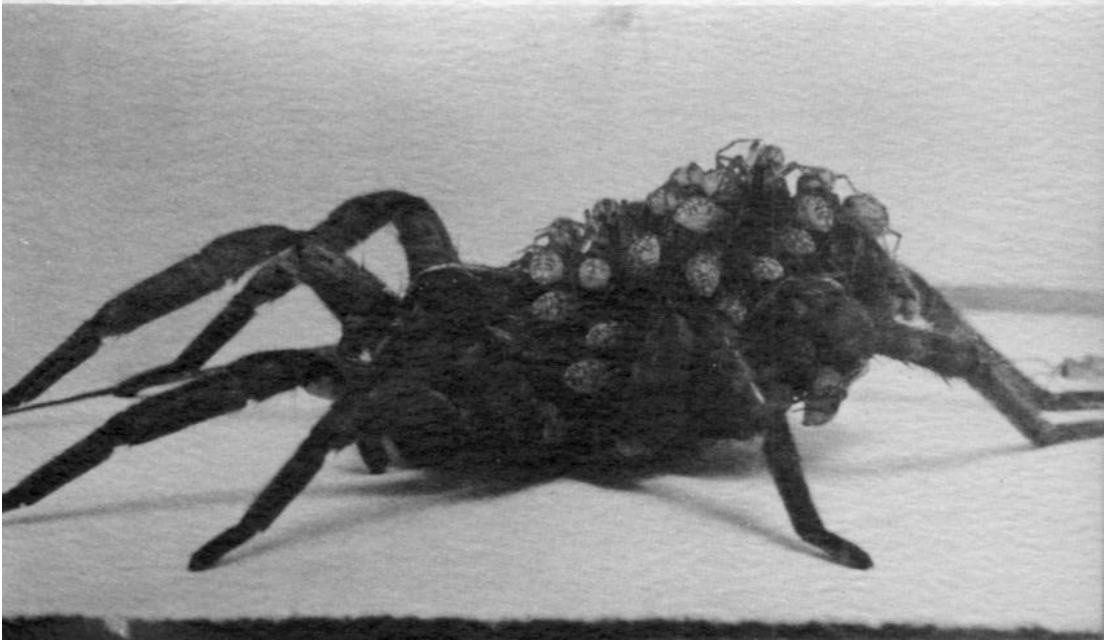


In natural history photography there is frequently a necessity for keeping the flash set in operation for hours at a time. With a bird, for example, the lights are placed, switches thrown, and camera focused on the spot where the subject is expected to appear. The operator retires to a blind or the end of a remote-control cable and waits (and sometimes he waits and waits). While a flash set is turned on there is a battery drain whether flashes are being produced or not, hence the length of time before a set runs out of juice is a factor of great importance. In this respect the hummingbird set is superior to anything we have seen. In fact we have yet to work a long enough day to run it down completely.

The versatility and adaptability of the hummingbird set are the features which most excite our admiration. A single unit may be slung from the shoulder, hooked to the camera, and handled just as a newspaper photographer uses his familiar photoflash. Or, two units may be used together, or, as with our hummingbird color photography, all three.

At this writing, Dr. Edgerton, on a grant from the National Geographic Society, is developing a new and more powerful "beam" or "spot" flash. This is for use in the field with a long-focus lens on subjects which cannot be approached closely. We are now testing an experimental model and our experience to date indicates that it is something which will prove to be of the greatest value to nature photographers.

PICKABACK—After the spiderlings emerge from the egg-sac, the mother carries them for a week or so.



Hummingbird Photography

Among the birds the favorite subjects for our high-speed flash photography have always been, and probably always will be, the hummingbirds. They are intrinsically so interesting, so varied in species (there are something like 600 species and varieties), so different in behavior, so beautiful in color, so accomplished in flight, so fearless and individualistic that our affection for them is beyond the telling. Moreover, they are particularly amenable to our photographic needs. To display the capabilities of the high-speed flash at its best, there are two requirements: the subject must be close and it must be in fast motion.

Few birds sit tighter than the hummingbird mother. On two different occasions we have sawed off the limb holding a nest and moved it a considerable distance without the bird flying off. One of our best subjects was a female Broad-tail which nested low down in a little spruce on the Evans Ranch three years in succession. We could set up and focus our cameras and place the lights, all within two or three feet of the nest. Then, when we were ready to try for pictures of the bird in flight, one of us would stick a finger under her tail and gently boost her off the nest. She would buzz around a little, then head back to the nest, and we could shoot her picture as she was about to land. We took hundreds of pictures of this bird (in 1947 Dr. Edgerton was with us).

Another subject had her nest about ten feet above ground in a pine tree on the C. A. Johnson ranch near Sedalia. We could drive the car under this nest and set up the apparatus on the car roof.

The male hummers have nothing to do with nest building, incubation, and care of the young. To picture them, it is necessary to catch them feeding at a favorite flower or, what is mostly the case, at a syrup bottle feeding station. They are no more shy than their consorts and, once they have learned to come to a feeding bottle, their voracious appetites (we show one which weighed 1/6 of an ounce and took 1½ times that weight in syrup per day) drive them back at dependably short intervals. The young male Rufous coming to the hand-held syrup cup learned the trick the first day it was tried.

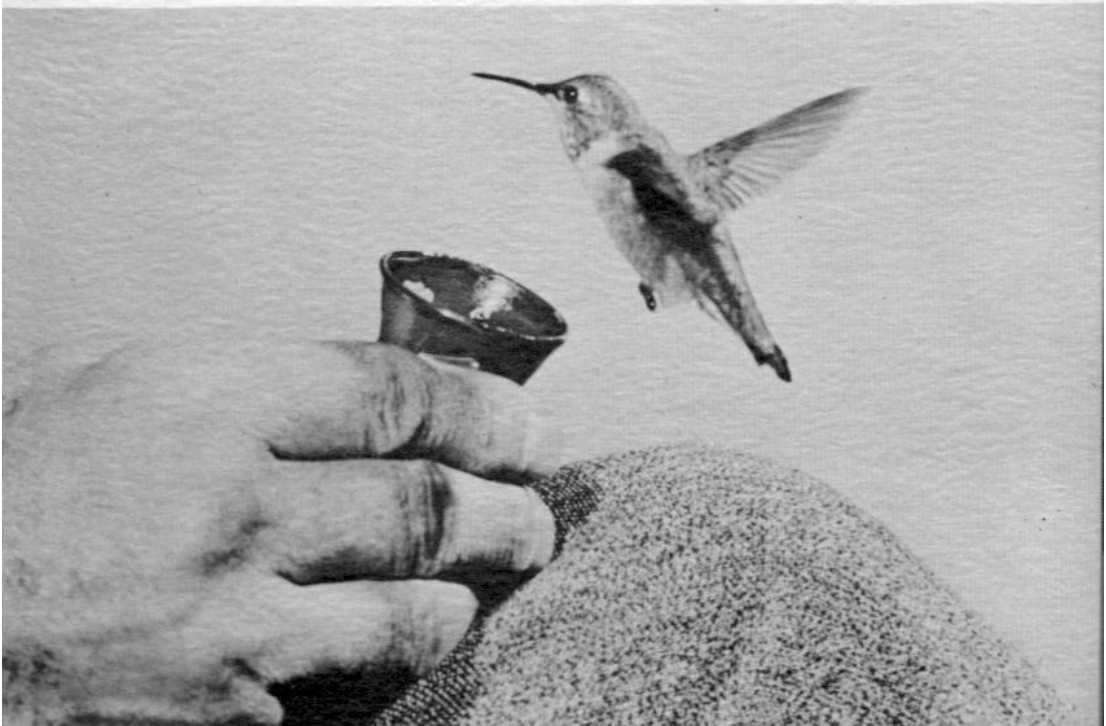
At the mountain home of Mr. and Mrs. W. R. Willis in Ute Pass near Colorado Springs, the hummers have been cultivated for years and this is also the case in Mrs. H. S. Silverstein's garden in Denver. When we photograph at these places, we take down all the feeders but one, and fix that in a spot convenient for our operations. The birds waste no time in finding it. Sometimes at the Willises we

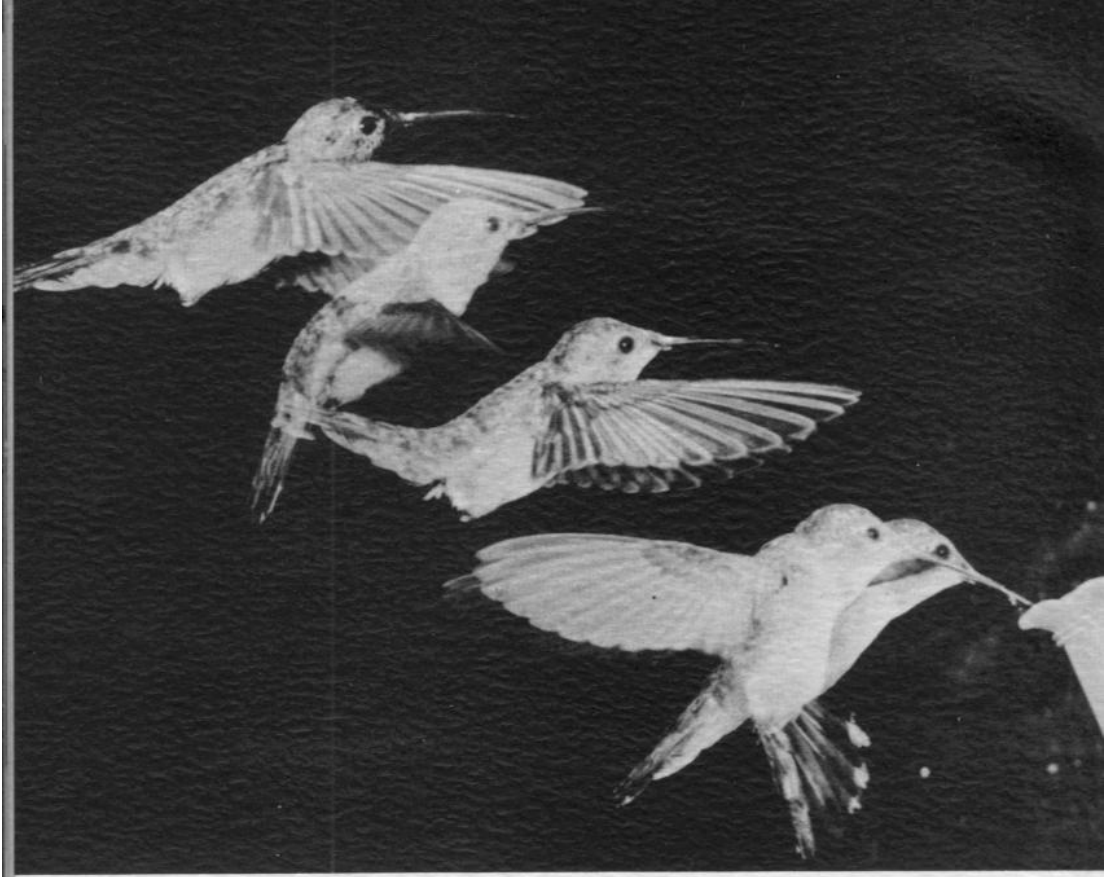
have had a dozen in sight. Late in the summer there will be males and females of two species—Broad-tailed and Rufous—and occasionally a third, the Calliope. This last is the smallest of all our hummers, weighing no more than a dime. You could send about ten of them first class mail for a three cent stamp!

When we go for color pictures of these birds, we have evolved a plan which works quite well. A colored background is hung behind the feeder, and flowers, preferably of the kinds being visited by the birds, are arranged on the camera side of the feeder. The flowers serve two purposes—they mask the artificial feeding bottle and they force the birds to come in to the bottle facing head-on to the camera. This last is particularly important with the males, for it is the brilliant gorgets which spell success with these pictures.

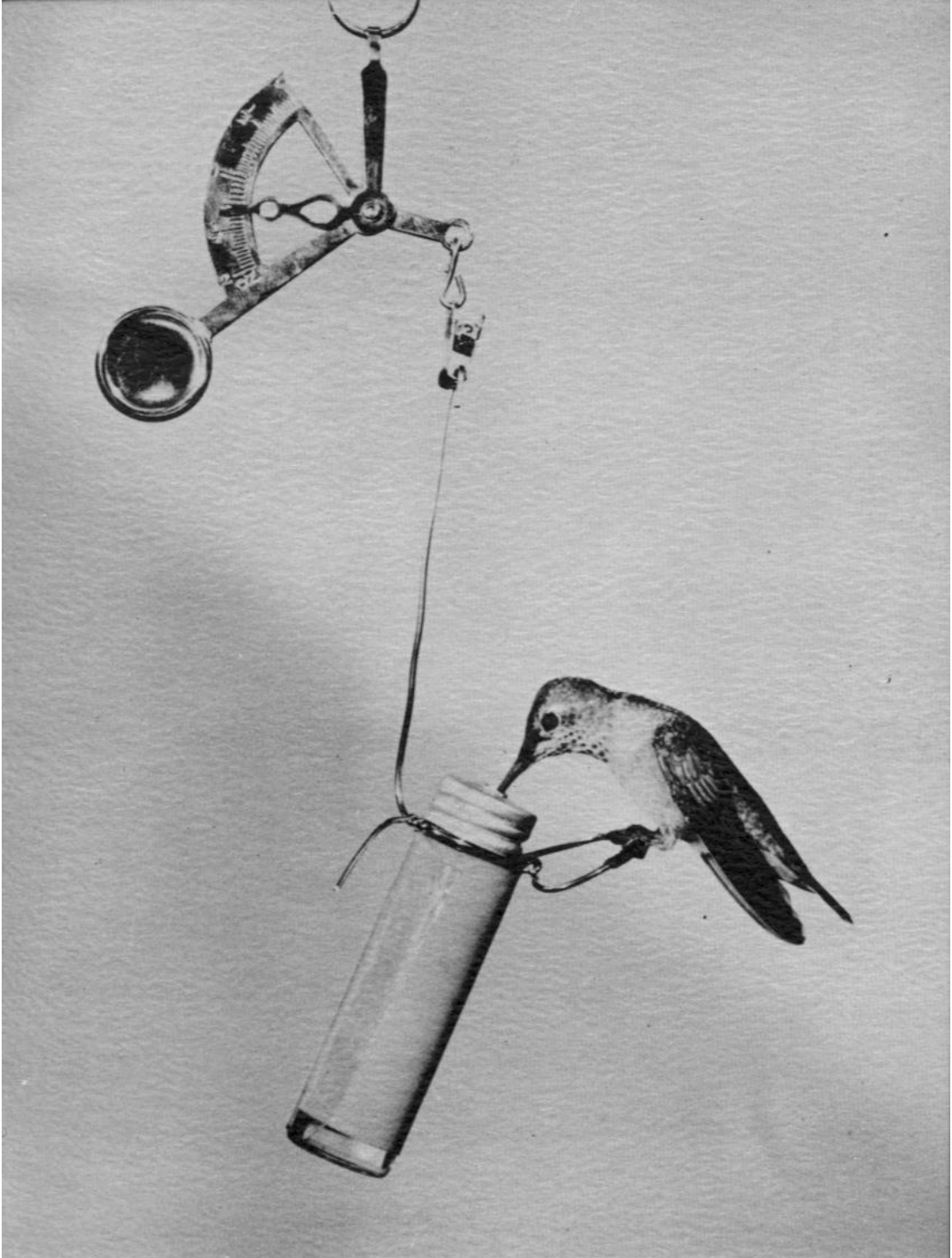
With the three-unit hummingbird set we usually place two of the lights, one on each side, a little ahead of the camera and a little higher and far enough to the side so as not to throw bad shadows on the background. The third flash is well above and behind the subject. It lights the background and sharpens the top line of the subject. Most of our color pictures with this set-up have been taken on Daylight Kodachrome at f.16 and 1/5000 of a second.

"BROWNIE" was a young male Rufous hummingbird, *Selasphorus rufus,* who came to our garden in August, 1950, and remained until September 28th, the latest date we know of for the Denver area.

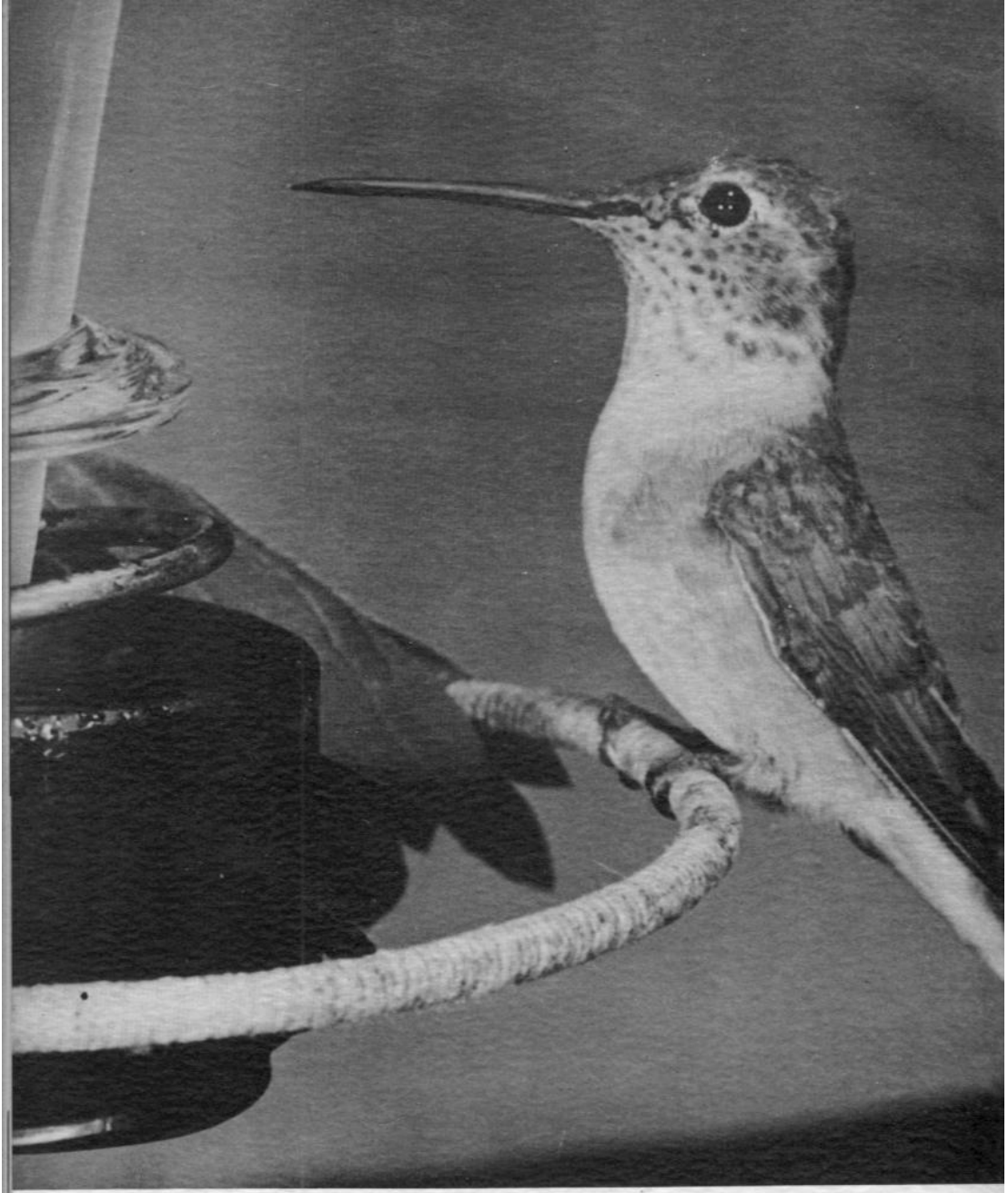




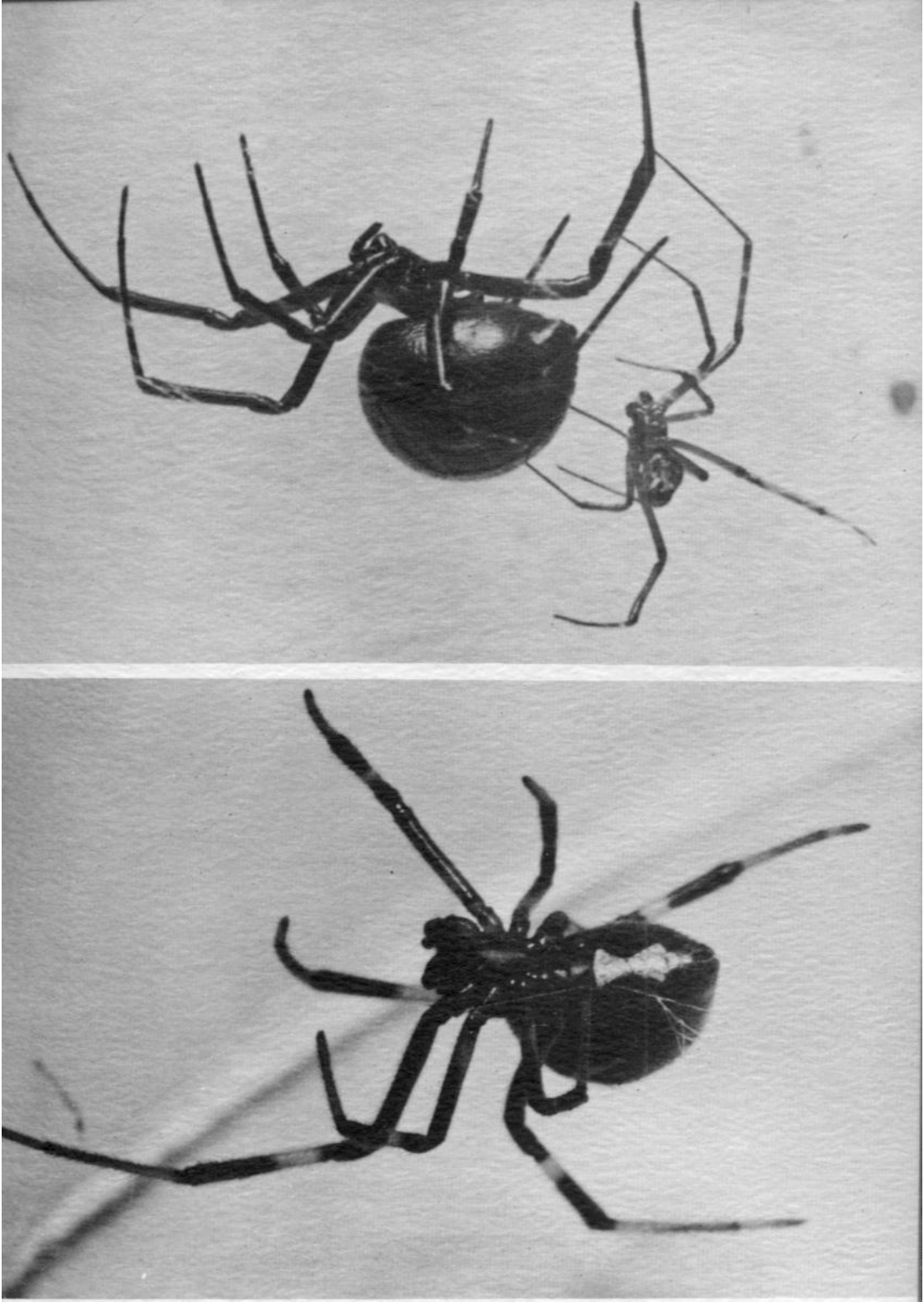
FLYING BACKWARDS. Often quoted in hummingbird literature is the Duke of Argyll's statement that "no bird can fly backwards". It is easy, however, to see that the hummer can do so and it is not difficult to take a motion picture of the act. What we have here has been called "a still picture of motion". It was taken with five high-speed flash units which were fired in rapid sequence by means of a manually operated switch. The first flash, which was set off when the bird's bill dipped into the feeder, started the withdrawal action which was caught in successive phases by the other lights.



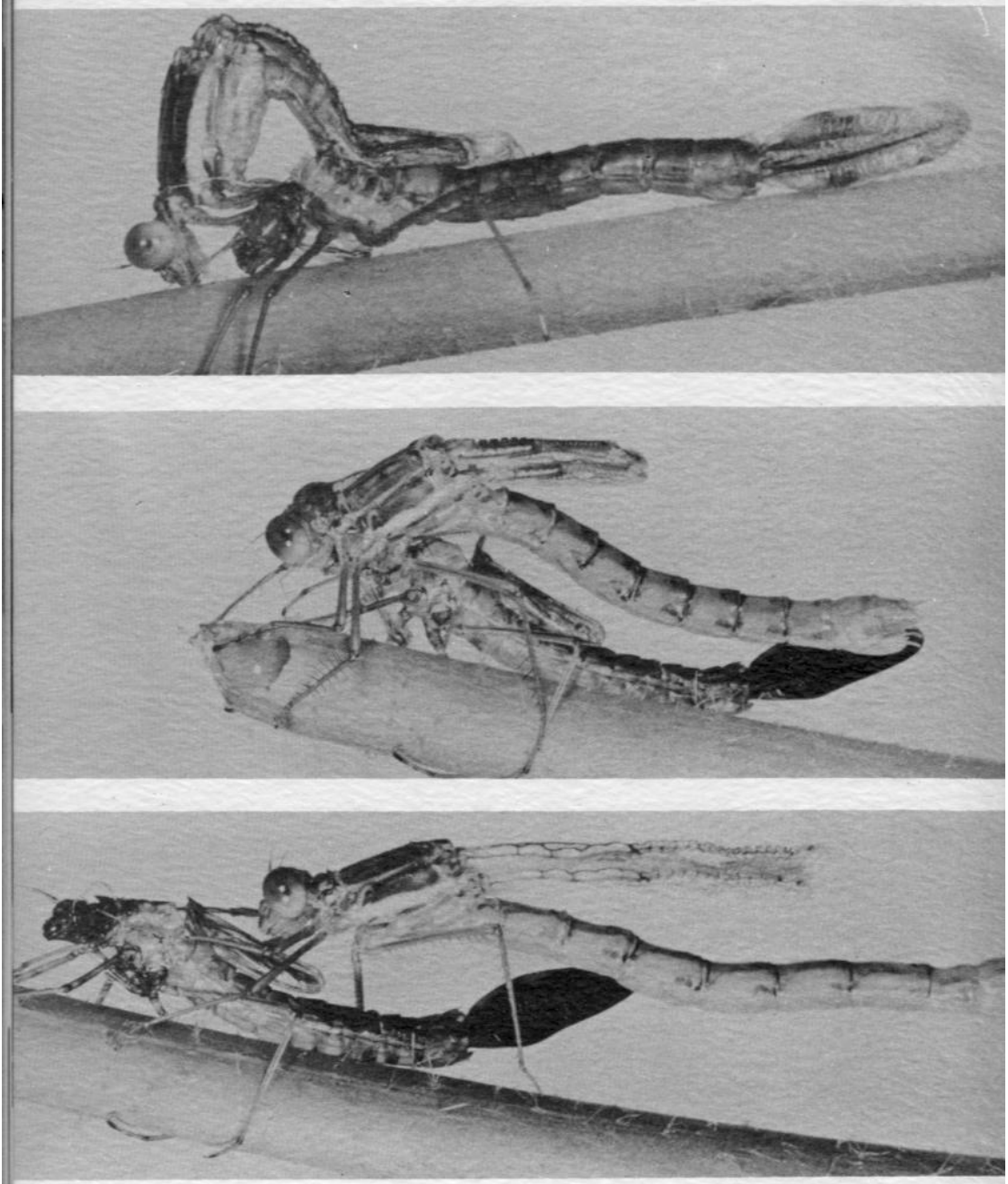
WEIGHING EXPERIMENT. This bird learned to come to a small syrup bottle provided with a wire perch and a small hole punched in the aluminum cap—too small for bees and wasps and large enough for the hummingbird bill. After making sure that only one bird was using the bottle, we were able, by making a series of weighings, to determine both her weight and the amount of syrup consumed. She weighed slightly less than one-sixth of an ounce and averaged nearly twice that in syrup intake per day.



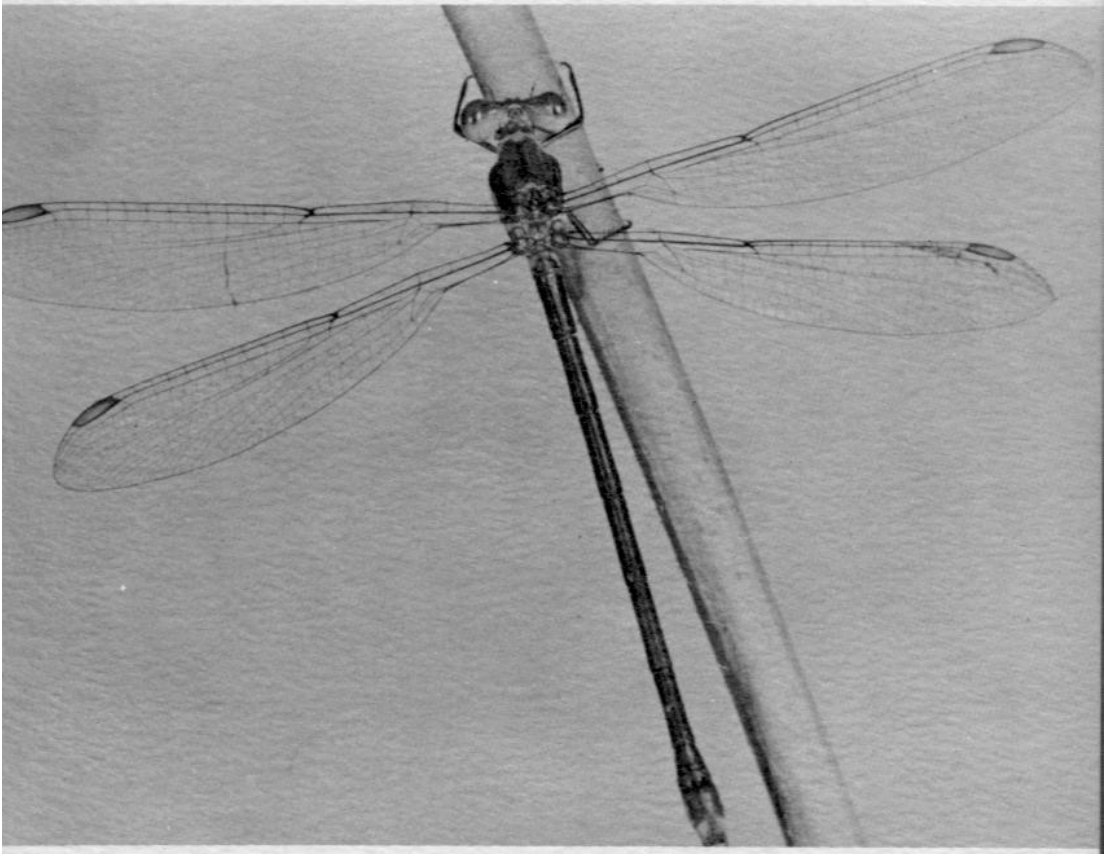
HUMMER at Willis feeder. This efficient feeder consists of a syrup flask inverted over a cup, the two held in position by a wire frame. The perch is an added attraction. A satisfactory syrup is made from 25%, by volume, of granulated sugar dissolved in tap water. The bird is a female Broad-tail, *Selasphorus platycercus,* the common hummer in this part of the Rockies.



BLACK WIDOW, *Latrodectus mactans,* above, male and female courting. Below, underside of immature female showing the characteristic hour-glass mark. Our *only* poisonous spider.



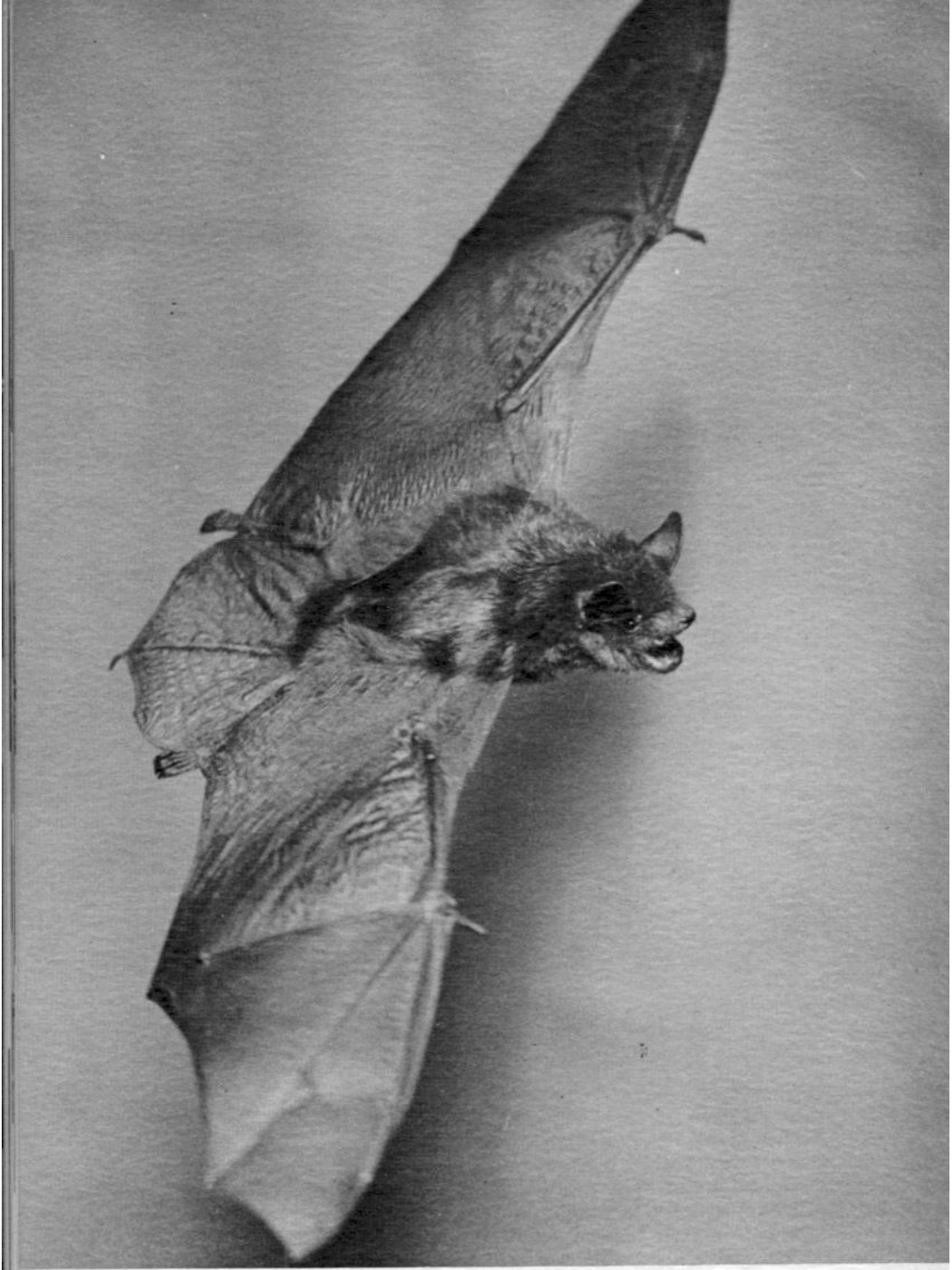
"A DEBUT", said Disraeli, "should be dull". This advice from the old master to the young member, making his first speech in the House of Commons, was doubtless sound enough, but, to our way of looking at things, the debuts of nature—the births, the hatchings, the moltings, the metamorphoses, the blossomings—save to the dull, are filled with never-staling wonder and excitement.



DEBUT OF A DAMSEL FLY, of the stalk-winged family Coenagrionidae.

THE FRINGE-FOOTED SAND LIZARD, *Uma notata,* is a denizen of our southwestern sand dunes and it has some interesting adaptations to life in that desolate and hostile environment. The fringe-feet, for example, serve the same purposes as the web-feet of frogs and ducks, making the feet more effective as paddles and thus increasing swimming efficiency, for this lizard is literally a swimmer, but a swimmer in fine sand, not water. When disturbed or frightened, it will run swiftly on the surface, then dive into the sand and with a few strokes of the hind legs disappear from sight in the wink of an eye. A place under the sand is also an essential refuge when the sun is at its hottest (hot sun is fatal in a few minutes), and when the time for sleep comes around. The animal also has special adaptations to keep sand out of eyes and nose—lappets along the eye-lids and valves to close the nostrils. Our specimen came to us by air on loan from Dr. Charles H. Lowe, Jr., of the University of Arizona, and pictures were made for *Natural History Magazine.* The lizard was collected by Dr. Lowe at the north end of the Yuma Dunes in Imperial Valley, California.

TARANTULA, *Dugesiella echina,* a species fairly common in the Arkansas Valley, but not ranging as far north as Denver. Not poisonous to man, in fact, no tarantula found in the U.S. is. This picture was taken with an exceedingly small stop—about half a stop beyond f.128—at 1/5000 of a second. This gave the greatest possible depth of focus and it illustrates, also, the great brilliancy of the flash.



SPALLANZANI 200 years ago hung threads from the ceiling of a room with a little bell at the end of each and found that a bat flying in the dark could avoid striking the strings and ringing the bells. This picture by Dr. Edgerton was snapped when the bat cut the beam of an electric eye.

Pet Pix

An old cat book says, "photographing cats will drive them insane." And sometimes we have thought that the same might be said of the photographer! For pictures of cats, dogs, and other pets are fully as difficult to make as those of the untamed animals. In the old days, when films and plates were slower and the best artificial light came from an explosion of flash powder, the obstacles to be overcome were far greater than is the case today. The zoom of just one flash, we imagine, might easily frighten an animal out of its wits.

The high-speed flash almost entirely eliminates this difficulty. It is so fast that animals are hardly disturbed at all by it. In the early and experimental days of high-speed flash work, Edgerton and his associates, Germeshausen and Grier, were struck by this—"A great deal of favorable comment," they wrote, "has been received regarding the absence of glare following the flash, on the audience and actors, at indoor evening events."

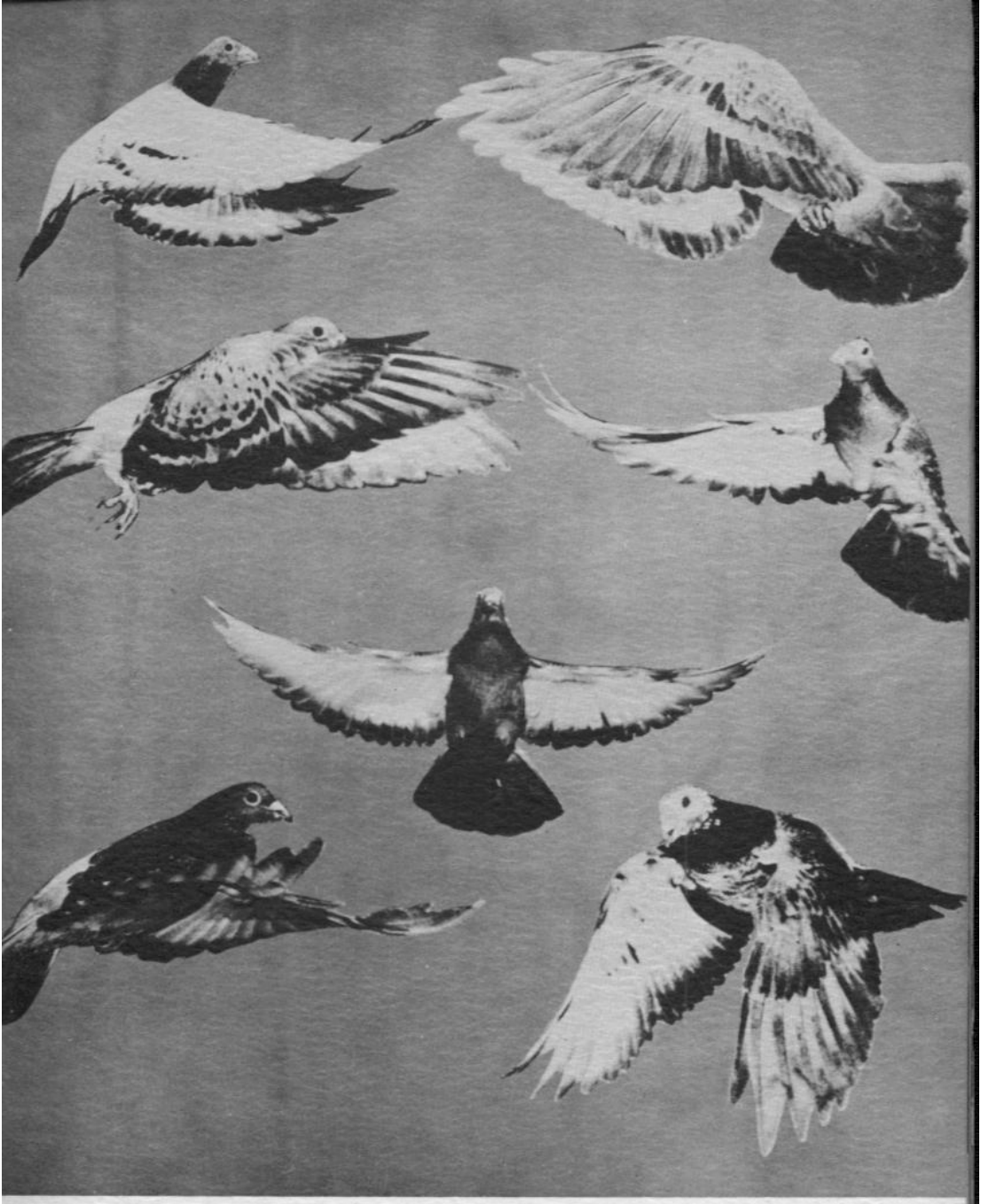
WHY didn't somebody tell me it was gonna be like this?

In our hummingbird photography we have had a similar experience. The click of a camera shutter will sometimes frighten a bird. But the flash alone goes unnoticed.

The general procedure we have found the best with dogs, for example, is to place lights and background and set up camera in focus on the scene of action. Then attract the subject to it and with remote-control button or long cable release in hand shoot when an interesting pose is taken. The Why-Didn't-Somebody-Tell-Me picture of the Welsh Terrier and her puppies was taken this way.

The head study of a Welsh Terrier puppy was made similarly with the puppy held on her owner's lap. This was made with three lights—one at each side and one behind—and with a pin-hole stop. After focussing, the front element of the lens was removed and a thin brass disk with pin-hole in center was inserted over the regular diaphragm, then the front element was replaced. The stop, we calculated, was about ½ stop beyond f.128. The pin-hole served to increase depth of focus and it demonstrated the brilliancy of the lights as well.

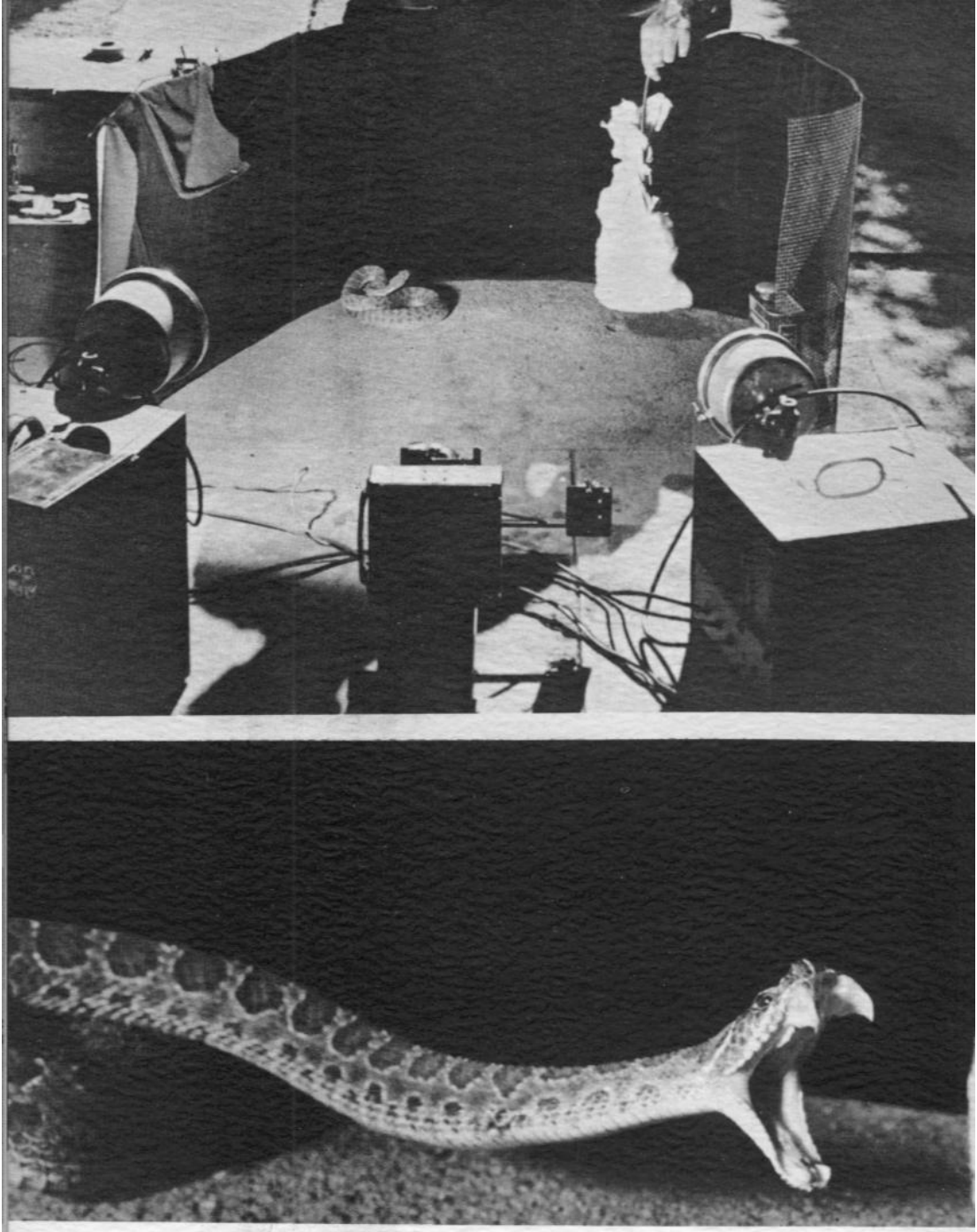
PORTRAIT of Welsh Terrier puppy.



. RACING PIGEON Wing patterns.

RACCOON, *Procyon lotor,* more common in these parts than you might suspect.

BLACK-FOOTED FERRET, *Mustela nigripes,* is the largest member of the weasel family in our territory. It is rarely seen, an inhabitant of prairie-dog towns, and thought to be on the way to extinction.



PRAIRIE RATTLESNAKE, *Crotalus viridis viridis,* in the act of striking. The target is an electric light bulb padded with cloth, used because this snake strikes more readily at a warm target than at a cold. This is the only poisonous snake in the Denver area.

OOPS!! The high-speed flash has been responsible for many remarkable sports pictures. This example is by Fred M. Mazzulla, Denver attorney, an amateur photographer with professional skill.

Photomicrography

All the scientific knowledge we possess of the world we live in comes to us by way of our five senses and 99% of it is said to be due to sight and the tools we have invented to increase the accuracy and sensitivity of this means of perception. These tools include telescope, microscope, spectrograph, cloud chamber, and camera and a host of measuring and recording instruments which go with them.

Of these, the camera most closely resembles the human eye but it outdoes that imperfect organ in every way—permanently fixing what it sees, recording by lights—X-ray, ultra-violet and infra-red—beyond the range of human vision, and photographing motion too fast to be seen by the unaided eye. It is in combination with the other primary tools that the camera has attained the greatest range of visual perception. The largest telescopes are exclusively photographic and the microscope-camera combination is of almost equal value.

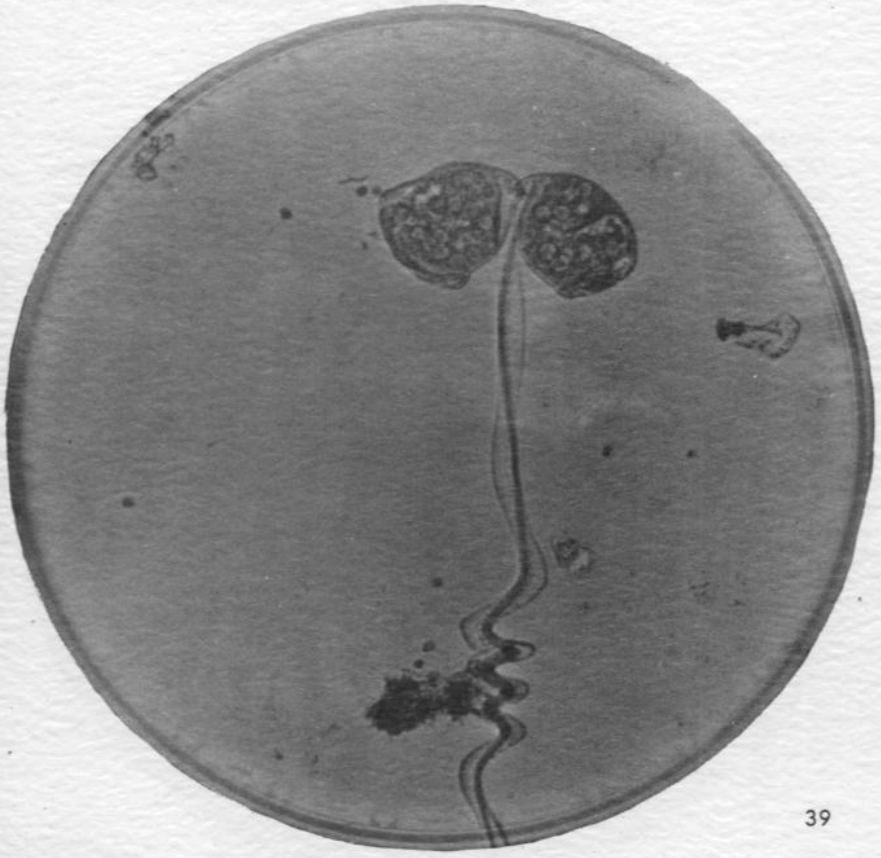
Galileo saw the satellites of Jupiter in 1610 through a telescope of his own construction modelled on a Dutch discovery made a few years earlier, but it was not until a couple of generations later that the first observations were made on microscopic organisms by Antony van Leeuwenhoek, amateur scientist, inventor and maker of his own microscopes, merchant and petty official of Delft, Holland. He was the first man ever to see bacteria, vorticellids, rotifers and many other microscopic organisms of importance.

The vorticellid is called a "bell animalcule", a single-celled, though somewhat complex, microscopic animal found all over the warm parts of the world in pond water. Its main part is bell-shaped with a ring of hairlike cilia at the mouth, their rythmic waving causing a little vortex or whirlpool in the water which serves to draw into the bell the smaller animals and plants on which the vorticellid feeds. The bell at its closed end is attached to a long stalk which fixes itself at its base to a water plant or other anchorage. When the vorticellid is feeding, the stalk is stretched out to its full length. When the little animal is disturbed by some passing monster, perhaps a paramecium, the bell contracts into a tight ball and the stalk draws it back with great suddenness in a most peculiar manner, shortening itself by taking the form of a closely wound spring. "After the fashion of a copper or iron wire that, having been wound close around a round stick, and then taken off, kept all its windings", is the way Leeuwenhoek described it in his letter of October 9, 1676, to the Royal Society first announcing his discovery.

We are well aware that the foregoing description will only be confusing and fantastic to those who have not had the opportunity to study the world of the little animals with their own eyes, but to those who have, it will bring back the remembrance of a thrill which is hardly to be matched at the introduction to any other division of natural history.

The rotifers, or "wheel animalcules" (*animalcules* means little animals), are a cut above the vorticellids in the evolutionary scale,

VORTICELLA. Botanists who recall Darwin's observations on climbing plants will note an interesting point about the coil in the vorticellid stalk. The part shown is the center of the stalk where the direction of the coiling reverses so that it goes one way above and the opposite below. This device makes it possible for the coil to contract or extend without twisting either the foot or the bells. Tendrils of the grape vine and many other climbing plants work the same way.



being multicellular, bisexual animals with sense organs (a rudimentary eye, for example), a nervous system, gonads, stomach, and excretory apparatus. A few live in the sea, but nearly all the thousands of kinds are found in fresh-water rivers, ponds, and swamps. The species shown here belongs to the common and widely distributed genus *Philodina*. It resembles the vorticellids in one respect—around the mouth are two sets of cilia which in action draw in a current of water. Leeuwenhoek, who was the first to describe it said, "and thereupon there suddenly came out of its roundness two little wheels, which displayed a swift rotation. These little wheels were as closely beset with teeth, or cogs, as the wheel of a watch might be; and when these animals had thus performed their actions for some time, they pulled their little wheels into their body again." The cilia, of course, are not really wheels, turning on an axle. But that is the way they look.

ROTIFER, *Philodina sp.*, about 500 times natural size.

Because of the fact that the microscope magnifies not only size, but apparent motion as well, the photography of these microscopic organisms has always presented a problem. Photomicrography requires relatively long exposures and movement by the subject is fatal to success. Hence the usual practice has been to picture freshly killed specimens, or those slowed down by a narcotic, or by thickening the water with some gelatinous substance. This suggested the use of the high-speed flash with its short exposure and brilliant light.

We made the accompanying pictures without any special apparatus whatever. After finding a suitable subject in a drop of water on the microscope slide, the scope was turned to a horizontal position and the camera, with lens and shutter removed, was hooked to the eye-piece of the microscope with a cardboard adapter. Then the subject was focussed and centered on the ground-glass screen, film-holder substituted, microscope light moved aside, high-speed flash put in its place, and film exposed. Sometimes we got a picture, sometimes the subject had moved out of focus in the course of our preparations. Obvious improvements in the process which would make it possible to watch the subject and keep it in focus to the very moment of exposure, could be made by using a reflex camera such as the Exakta, keeping the scope in a vertical position, and arranging the two kinds of light to work interchangeably.

WORK SHOP set-up for making web pictures, the web being that of the Golden Garden Spider, *Argiope aurantia*. Lights on either side of camera are part of our hummingbird high-speed flash set, also tripod with accessory head for back and forth movement.

Spiders and Their Webs

The reader may have observed that the wheel-like orb web made by one of the spiders which produces this lovely work of art is next to impossible to see except when the light is right. In fact the best is sunlight, behind and above the web. Naturalists who study and collect spiders (arachnologists) have a rule: when looking for webs, always work toward the sun. This fact about the lighting and also the necessity for providing a black background make the photography of webs in the field very difficult and tedious. We learned long ago, however, that almost always a web seen afield may be reproduced in the laboratory. This is done by capturing the spider carefully in a way not to injure her and cutting the framework on which her web had been spun or similar branches. Then, if the frame is set up in the laboratory and the spider placed on it, she will usually spin the coming night. To keep her from escaping from the frame, we fix it over a large pan of water. If the spider manages to get away she will usually spin somewhere else in the shop and can be started over. After she has spun in the place prepared for her, the water pan may be done away with and the frame moved to suit the photographer's convenience.

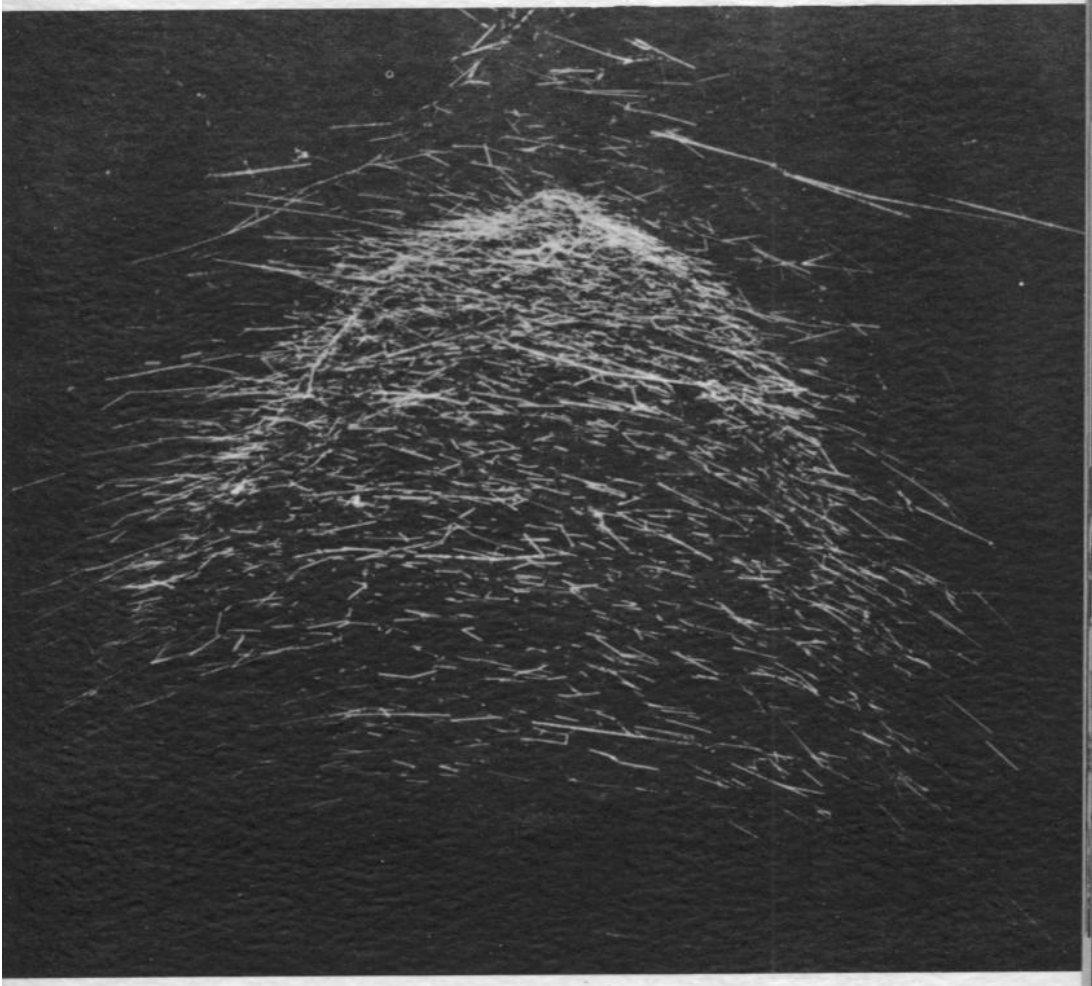
In order to bring out as strongly as possible the delicate filaments of a web, the first requirement is a black background—we use black velvet. To make this, photographically speaking, as black as possible, it is sometimes desirable to shade the background in such a way that no light whatever reaches it. This is done with a box of suitable size lined with black, the bottom of the box serving as background and the sides preventing any light from falling upon it.

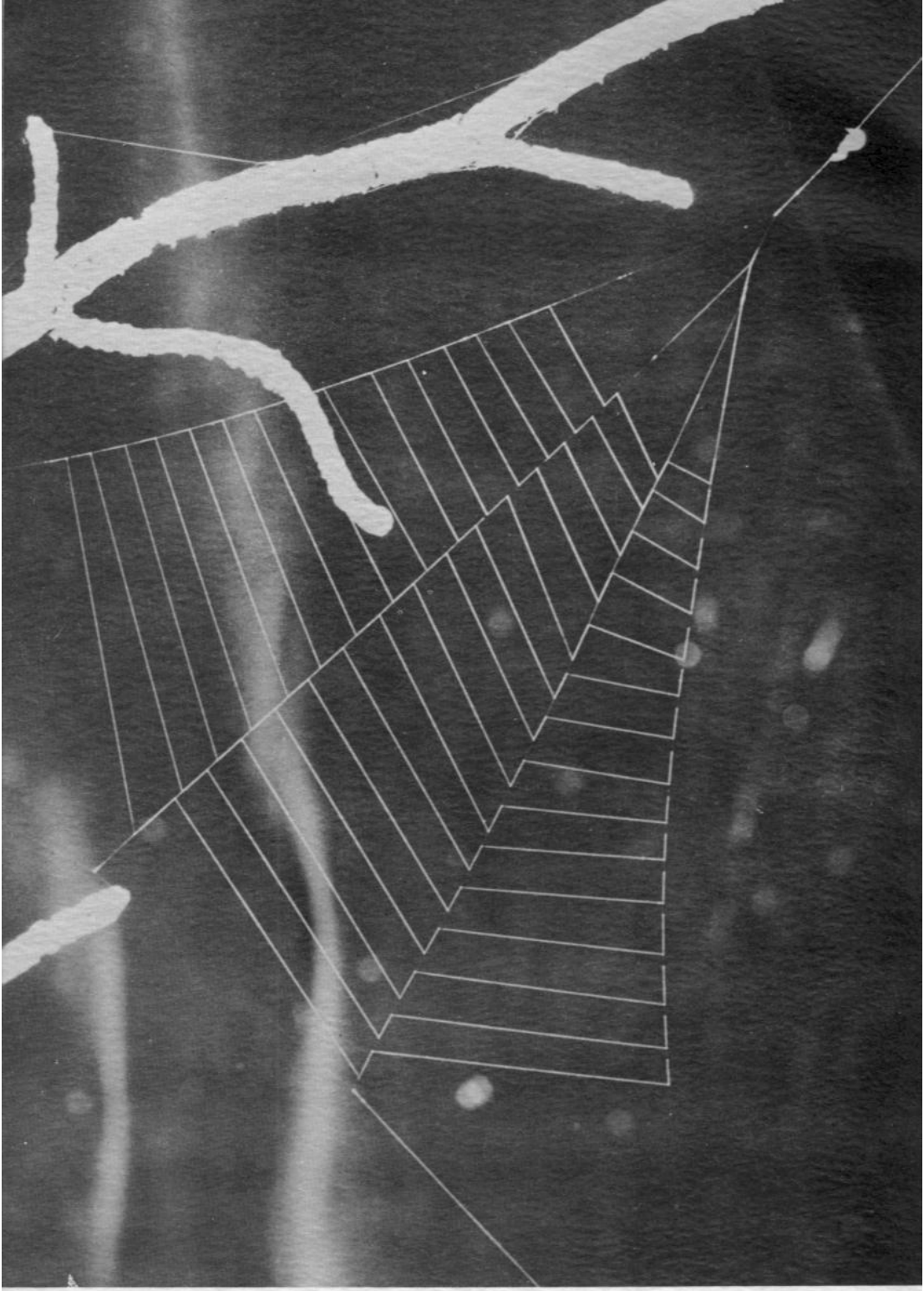
The second requirement is overexposure. This has the effect of magnifying the apparent diameter of the filaments, a thing that is necessary for reproduction by ordinary printing processes. We usually apply around five times as much light to a web picture as to other subjects. This overexposure has a disadvantage—solid parts of the picture, like framework and the spider herself, come out in white silhouette. We have sometimes been able to overcome this difficulty to a certain extent by lighting for the spider on the camera side of the subject and lighting the web from behind with three or four additional lights.

Years ago our first web pictures were made with photofloods, but we find that a set of high-speed flashes gets a better result. The slightest breath of air will cause a little motion of the filaments of a web and this is disastrous with the relatively long exposure required by photofloods. With the flash, however, it makes no difference.

A most interesting spider, rare with us, is the Triangle Spider *(Hyptiotes gertschi)*. This spider does not make a complete orb web—just a pie-shaped section with four radii coming to an apex on a single strand where the spider rests and holds the web taut. When a flying insect strikes the web, the spider lets the trap go slack, thus effectively entangling the prey.

DOME WEB. This delicate and beautiful structure is common enough but can only be seen when the light strikes it just right. Here the extreme brilliance of the high-speed flash in effect magnifies the filaments. The spider is *Linyphia marginata*.





WEB OF TRIANGLE SPIDER *(Hyptiotes gertschi)*—one of the most ingenious insect traps and rather rare with us.

Books

FLASH by Harold E. Edgerton and James R. Killian, Jr., published by Hale, Cushman & Flint, Boston, 1939, is *the* book on high-speed flash photography. Unfortunately it has been long out of print, but a new edition, we understand, is planned. FLASH contains a comprehensive bibliography on the history and scientific aspects of high-speed flash photography, as well as directions for building a home-made set (our first was built on these directions), and a collection of the most interesting and beautiful examples of high-speed flash photography ever published. While the book is now out of print, it is available in most public libraries.

SPEEDLIGHTS by Arthur Palme, published by American Photographic Publishing Co., Boston, 1946, gives, in small compass, an explanation of what the high-speed flash is, its history, the functions of the component parts, how to build a simplified set, and how to use it. This excellent little book also contains a bibliography and many interesting high-speed flash pictures.

STROBE—THE LIVELY LIGHT by Howard Luray, Camera Craft Publishing Co., San Francisco, 1949, is a thoroughly practical discussion of the flash, how to build it, how to operate it, and what may be obtained in the way of interesting results.

All the photographic magazines, both here and abroad, have published high-speed flash articles and pictures. American Photography has had a regular department devoted to the subject authoritatively conducted by Andrew F. Henninger, and announcement has been made of a book on the way.

For readers interested in the scientific side there is a wealth of material to be found in the technical journals, and, for those considering the construction of a high-speed flash set, the popular radio, scientific, and mechanics magazines should be consulted as all have handled the subject. One should bear in mind that new developments in the field are still taking place, hence the up-to-date and current material is the most valuable. For this reason and for want of space we are not giving here a bibliography of periodical literature.

Nature Photography with the High-Speed Flash

Part Two

Using Cameras with Focal Plane Shutters

By Alfred M. Bailey

In the first section of this paper Walker Van Riper and Robert J. Niedrach have given an historical sketch of the development of the high-speed flash by Dr. Harold E. Edgerton, and have told something of their extensive work in the field of nature photography. Following Edgerton's suggestion, Van Riper built his first "strobe" and learned the hard way to solve various difficulties; he had the technical know-how to master many of the problems confronting the pioneer in this type of work, and with Niedrach made many experiments to improve upon the methods they were using.

My desire, as I know little of mechanics, has been to secure equipment more or less foolproof which would make possible satisfactory shots of wild life under adverse light conditions. Cumbersome, nonportable machines which would fail to function readily were apt to be more of a hindrance than an aid in my work. In recent years I have exposed thousands of feet of motion film, and have had to lug around heavy motion picture cameras, and have tried to eliminate bulk and weight wherever possible. Consequently, I have used small cameras for still pictures, the 35 mm. Exaktas being ideal for the majority of shots (see *Nature Photography with Miniature Cameras* and *Stepping Stones Across the Pacific,* Museum Pictorials Nos. 1 and 3).

In securing movies and still pictures in the past much of my work has been with Robert J. Niedrach. We have been dependent upon sunlight for satisfactory results, and many are the hours which have been wasted because low-hung clouds cast a heavy gloom over the landscape, and the dispositions of two irritated camera men. When such conditions prevailed, there was nothing we could do about motion pictures, but we could use the open flash and, in later years, the flash bulb to good advantage for making stills. There are several drawbacks to bulbs however, the main one being the expense, where many pictures are being taken.

My interests in flash photography go back many years to the time when the National Geographic Magazine published the fine portraits made of deer at night by one of the pioneers of such work, George Shiras, III. My friend Tappan Gregory also set trap

cameras along the shores of Lake Michigan, and stalked deer with his bulky equipment in the bow of a canoe as a companion quietly paddled him into photographic range; and many of his excellent results were published in the JOURNAL OF MAMMALOGY and elsewhere.

Influenced by the above photographers as well as by the fine results obtained by Akeley, Clark, and others in Africa I secured equipment for making night pictures to take along on our Museum expedition to Arctic Alaska, and many portraits were made of the Eskimos during the long nights.

On my next expedition to Abyssinia on behalf of the Field Museum, I tried for pictures of big game but the results were not worth the effort. It was then necessary to place cameras along game trails and have the intended subjects walk into a string, trip the shutter and shoot the flash. A few carnivores pulled at the bait, and an occasional antelope stumbled over the wire and was caught in an awkward position when the cartridge exploded with a boom and a glare of light that frightened everything in the near vicinity, but by far the best picture was one of my startled companion who walked into the set.

The years rolled along and we became interested in making 35 mm. motion pictures of nature subjects. The old Shustek, Akeley, and Bell and Howell cameras were so heavy, we did not bother making still pictures; instead we gradually depended upon enlarging from movie frames to secure photos for illustrating articles. Then 16 mm. color film became available, but blow-ups were not satisfactory for magazine reproduction, and we once more began to tote around hand machines, and were even ambitious enough to take a few flash bulb shots. Then I secured my first 35 mm. camera—a secondhand Exakta, and a new field was opened.

The development of the strobe has given great impetus to nature work, and for several years I watched Van Riper and Niedrach with envy, for my 35 mm. cameras with focal plane shutters were not suitable for use with the high-speed flash. Now, however, the Exakta V and the more recent Exakta VX have been developed with built-in synchronization, and any of the experiments described in the preceding pages could be duplicated with these small cameras—and often with greater ease because the single lens reflex has many advantages in focusing. The one difficulty is that the shutter speed must not exceed 1/50 of a second in order that the curtain may be fully open at the time the flash is released, and thus give a uniform exposure to the whole frame. With this one provision, it is now possible to do practically anything in subdued light with the 35 mm. Exaktas that can be done with cameras fitted with between lens

shutters. It should be noted, for obvious reasons, that in bright sun the strobe is useful for fill-in light only when a shutter speed of 1/50 is used, for where the light is strong a moving object could not be stopped at such a low shutter speed. To keep from having a secondary image we arrange a shade for the area to be photographed, and consequently the entire exposure is the result of the flash.

During the past year Niedrach and I have been doing considerable field work. We have been using the three-unit outfit developed by Edgerton for work on the National Geographic-Denver Museum Expedition in Arizona, described in Part One, and the little Strobonar which gives an exposure of about 1/1000 of a second, fast enough for the majority of nature subjects—even hummingbird wings showing little movement. Although any number of "slave" units could be set off at once, for many shots it is impractical to use more than one light.

Beautiful shots of birds and mammals can be made by remote control. That is, the camera is focused at a given spot—a nest, a flower, or a feeding place, and the shutter tripped by cable or electrical release with the operator at a distance. Most subjects tend to become very frightened, however, when they are disturbed by the approach of the photographer to change film, and consequently we have had our best results by erecting blinds in which the Exakta and movie equipment and photographer can be concealed. Unfortunately, the hiding places must usually be located so far back from the animal to be photographed that lights are ineffective at such distances, and the only solution to obtaining satisfactory still photographs is to place the flash out in front of the cameras.

In case of the open flash or of bulbs it is always necessary for the operator to reveal himself to his victim after each shot, just as is the case when shooting by remote control. It is surprising how quickly a bird or mammal becomes adjusted to having a brief glare of light a short distance away—but it rarely becomes accustomed to a two-legged beast crawling from a hiding place to replace a charge.

The high-speed flash has changed all this and our method of photographing wary birds—and the same could apply to any form of wild life—is to work from a blind and to have our hiding place far enough away so our subject will accept it. If light conditions are suitable for movies we place our Cine Special on a tripod at the left and a 240 mm. Schneider telephoto on a tripod at the right. We carry an Exakta V with black and white and the VX with color, and these can be quickly changed on the stationary lens. In photographing birds of medium size, the flash is connected with the battery by a long wire and is fastened on a tripod about three feet distant and slightly above and to one side of the nest, feeding tray, or other spot where

the bird is supposed to appear. The battery is placed conveniently near the photographer seated behind two tripods, so it can be turned on and off as needed, and not be run down needlessly. This has proved an ideal arrangement in our work, for the instantaneous gleam does not frighten the bird and in just a few moments the power has built up sufficiently for another exposure. Life history sequence shots can be obtained rapidly, often a dozen being taken as an adult bird feeds its young, while by the old method of remote control only one shot could be secured.

The Exakta, or any other single lens reflex camera, is ideal for such work in that it is possible for the photographer to keep his eye to the critical focuser, actually seeing through the lens what is being filmed; there is no problem of parallax in the case of a subject more than filling the frame, and the flash can be held until the bird or other animal assumes the posture desired.

The photographs of the spotted sandpiper and the Costa hummingbird illustrate the method we have employed. The former two were made from a blind, while the latter, as is obvious from the illustrations, were taken with the equipment in the open. In neither case was there any problem of stopping rapid motion—the light being used merely to give sufficient exposure; but had the birds been in action, the flash of 1/1000 would have resulted in a sharp negative.

The spotted sandpiper was nesting upon the ground near a little clump of alpine willows adjacent to Echo lake in our Colorado mountains at an elevation of about 10,000 feet. It was a gray day and the nest was shaded so even a slow speed with a wide aperture would not have given a satisfactory shot. A blind—just a little canvas tent—was placed about twelve feet from the nest and the bird soon became accustomed to it and readily returned. Then the light was mounted on a stick three feet away from the eggs, and the wire attached to the battery inside the blind. The first photograph made on panatomic X with a 50 mm. lens covered the whole area—the flash equipment, the small sandpiper on its nest, and the immediate environs being bathed in light. The second picture, the next exposure, was made from the same spot with the 240 mm. lens cut to a stop of f.16.

The photograph of the Costa hummingbird was taken with a 50 mm. lens in similar fashion, but without the use of the blind, as is shown in the photograph on the left. It shows the flash, and the Exakta V with the direct focuser attached to the 240 mm. lens on a tripod and the small bird upon its nest. The close-up of the hummer was shot with the camera on the 240 mm. lens from the position shown in the first illustration.

SPOTTED SANDPIPER
Actitis macularia
Photographed from blind with 50 mm. lens

Photograph by Alfred M. Bail
and Robert J. Niedra
Kine Exakta V 35 m
50 mm. Zeiss Tess

SPOTTED SANDPIPER
Actitis macularia
Photographed from same position with 240 mm. lens

Photograph by Alfred M. Bailey
and Robert J. Niedrach
Kine Exakta V 35 mm.
240 mm. Schneider

Photograph by Alfred M. Baile
and Robert J. Niedrac
Kine Exakta V 35 mm
50 mm. Zeiss Tessa

COSTA HUMMINGBIRD
Calypte costae

Showing Strobonar, Exakta V with Penta Prism viewfinder, and 240 mm. Schneider lens

Photograph by Alfred M. Bailey
and Robert J. Niedrach
Kine Exakta V 35 mm.
240 mm. Schneider

COSTA HUMMINGBIRD
Calypte costae
Photograph made from set shown on opposite page

Above:
BENT'S CROSSBILL
Loxia curvirostra benti

Below:
ROCKY MOUNTAIN PINE GROSBEAK
Pinicola enucleator montana

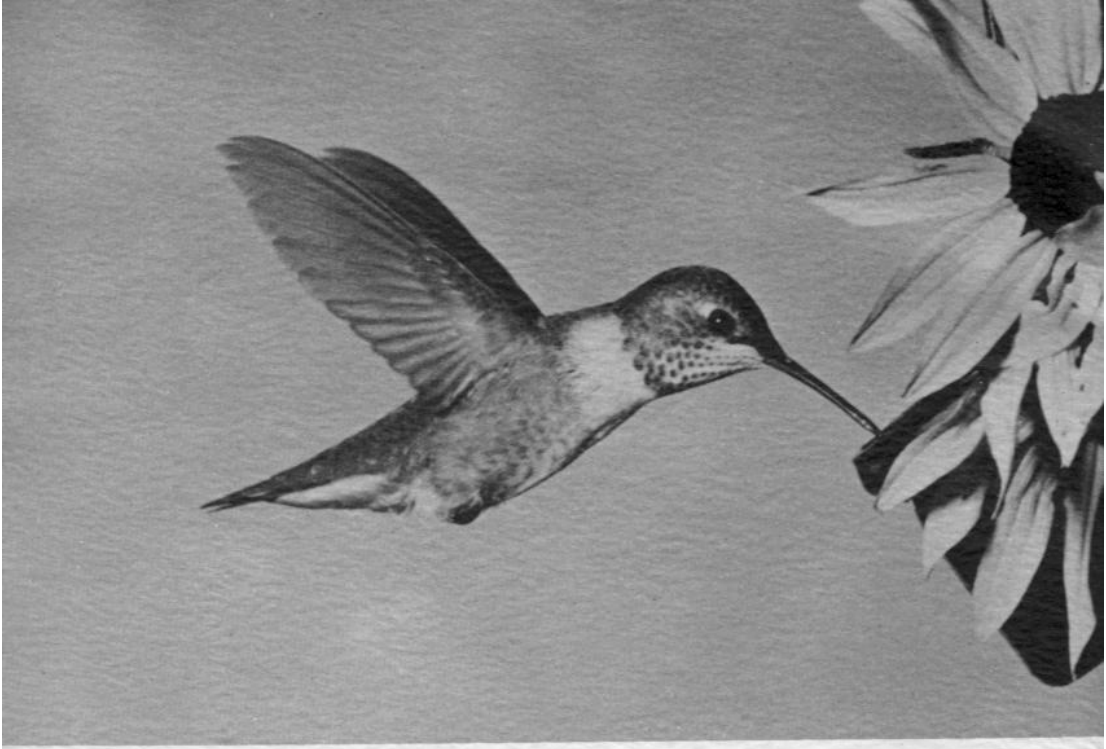
Photographs by Alfred M. Bailey
and Robert J. Niedrach
Kine Exakta V 35 mm
240 mm. Schneider

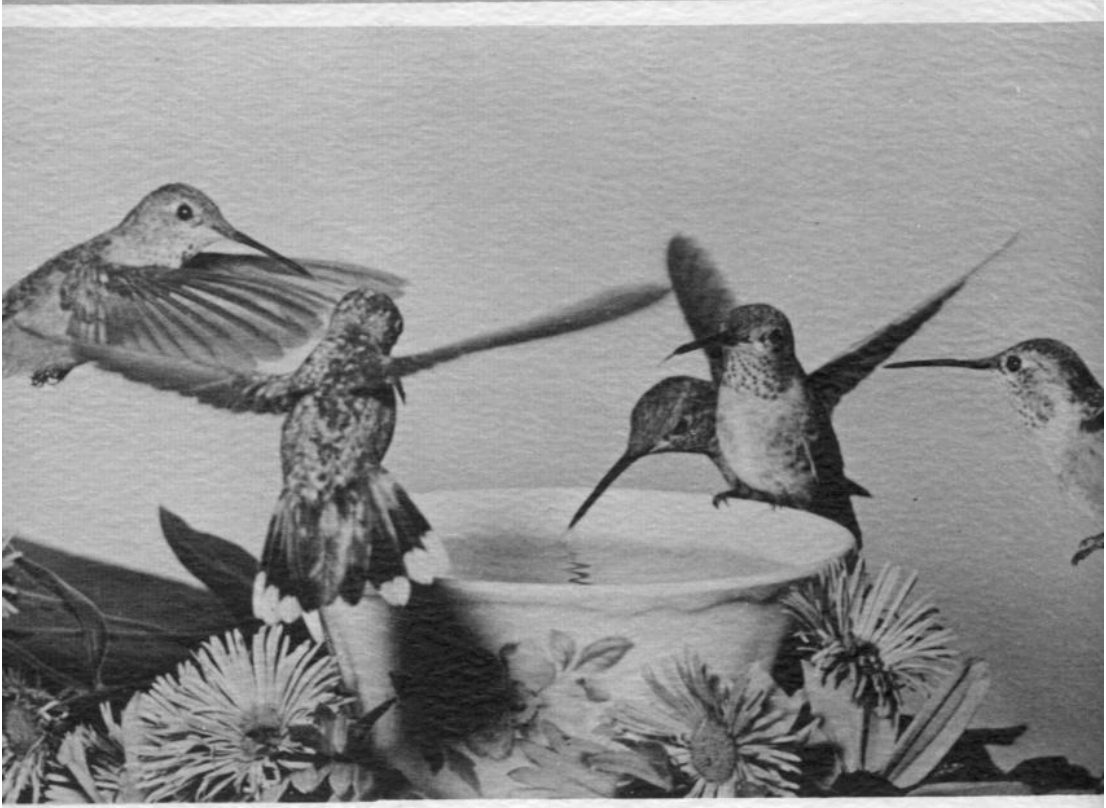
Crossbills and Rocky Mountain pine grosbeaks make interesting subjects to work with for they are very tame and no blind is necessary. Both species nest in the Colorado mountains, the latter at around 11,000 feet in Englemann spruce in July and August, and the crossbills usually in yellow pine at an altitude of about 8,000 feet, and often they have eggs and young during the coldest months of the year—December and January. We have made numerous pictures of both species, while balanced precariously at the top of extension ladders, by fastening a light on limbs a few feet from the nests, and holding the camera in our hands.

Every garden or wooded park has its quota of subjects available to the speed light photographer. House finches come readily to feeding trays in the Denver region, and robins nest commonly; small mammals, flying hawk moths, colorful caterpillars or hungry grasshoppers, all are worth recording.

WESTERN ROBIN
Turdus migratorius propinquus

Photograph by Alfred M. Bailey and Robert J. Niedrach
Kine Exakta V 35 mm.
240 mm. Schneider

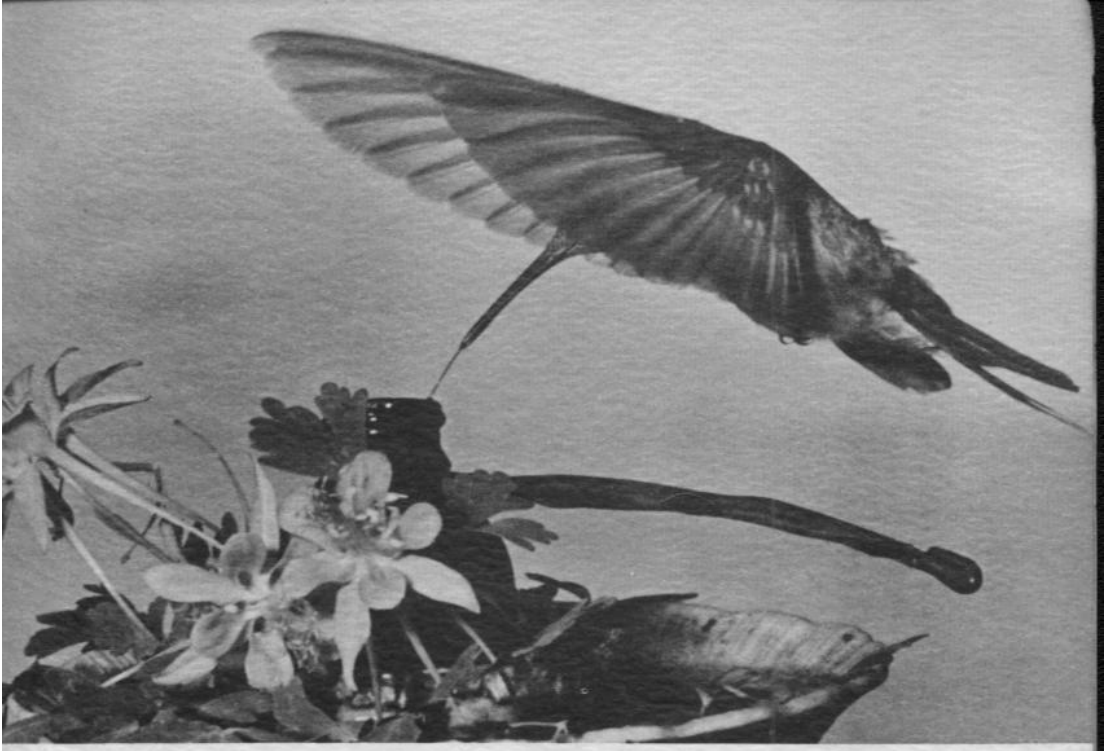




Above:
RUFOUS HUMMINGBIRD
Selasphorus rufus

Below:
BROAD-TAILED HUMMINGBIRD
Selasphorus platycercus

Photographs by Alfred M. Ba
and Robert J. Niedr
Kine Exakta V 35 m
240 mm. Schnei



Photograph by Alfred M. Bailey

ARIZONA BLUE-THROATED HUMMINGBIRD

As mentioned by Van Riper and Niedrach, hummingbirds make ideal subjects for the high-speed flash because they are tame and, if nests cannot be found, may readily be decoyed to a given place with sweetened water. During the late summer the local and migrant species often abound in gardens, working from one flower to another, and it is a simple matter to set up the flash and camera. By far the best results can be obtained where the birds are being fed.

Several species occur in Colorado when the migration is on, and the local broad-tails are hard put to defend feeding places; the little rufous hummingbirds which nest north into Alaska are common on their southward migration in mid-August, and are very pugnacious, literally dive-bombing the larger broad-tails as they attempt to feed. Sometimes members of both species swarm around a food container and, by using an adapter on the 240 mm. lens to make it possible to focus closer than ten feet, we have secured good-sized images of five birds with a single exposure.

Niedrach and I visited Carr Canyon in the Huachuca Mountains of southern Arizona where the excellent color shots of hummers were obtained the previous season by the National Geographic Society-Denver Museum Expedition. Major and Mrs. Healy made all the facilities of their beautiful mile high ranch available to us and we secured numerous pictures of mammals and birds of the area. The large blue-throated hummingbirds nested under the eaves of the

ARIZONA BLUE-THROATED HUMMINGBIRD
Lampornis clemenciae bessophilus

Photograph by Alfred M. Baile
and Robert J. Niedrac
Kine Exakta V 35 mm
240 mm. Schneide

BROAD-BILLED HUMMINGBIRD
Cynanthus latirostris

Photograph by Alfred M. Bailey
and Robert J. Niedrach
Kine Exakta V 35 mm.
240 mm. Schneider

MOUNTAIN BOBCAT
Lynx uinta

Photograph by Alfred M. Baile
and Robert J. Niedrac
Kine Exakta V 35 mm
50 mm. Zeiss Tess

cabins, and strobe shots were made of the large birds rising to the nest, incubating eggs, and hovering over flowers, a photo even showing the long tongue inserted in the sweetened bait. One of the prizes of the trip was a picture of the rare broad-billed hummingbird upon her nest in an alligator juniper. The sun threw heavy shadows upon the little female so a single speed flash slightly above and to one side was used to secure the accompanying illustration.

Mrs. Healy had an interesting pet, a young coati, a tropical animal which reaches the northern extension of its range in the Huachuca Mountains. This active little beast, known locally as a *chula,* was never still a moment and was in mischief throughout the day. His particular delight was to torment the ranch dogs, and whenever these unfortunate beasts desired a siesta, the coati was sure to jump all over them. One day a big truck came to the ranch with Clel Lee at the wheel, and a dozen of his lion-hunting dogs chained in the back.

"Look out for your *chula,* these hounds kill every one they see," Clel advised Mrs. Healy as he started to drag one of his sad-eyed dogs from the truck.

"Let the *chula* take care of himself," was the response just as the mournful old trailer hit the ground.

The coati rushed in and grabbed the surprised hound by the hind leg and tugged playfully away, while the normally savage hunter gave a startled yip and sat down to get away from his tormentor.

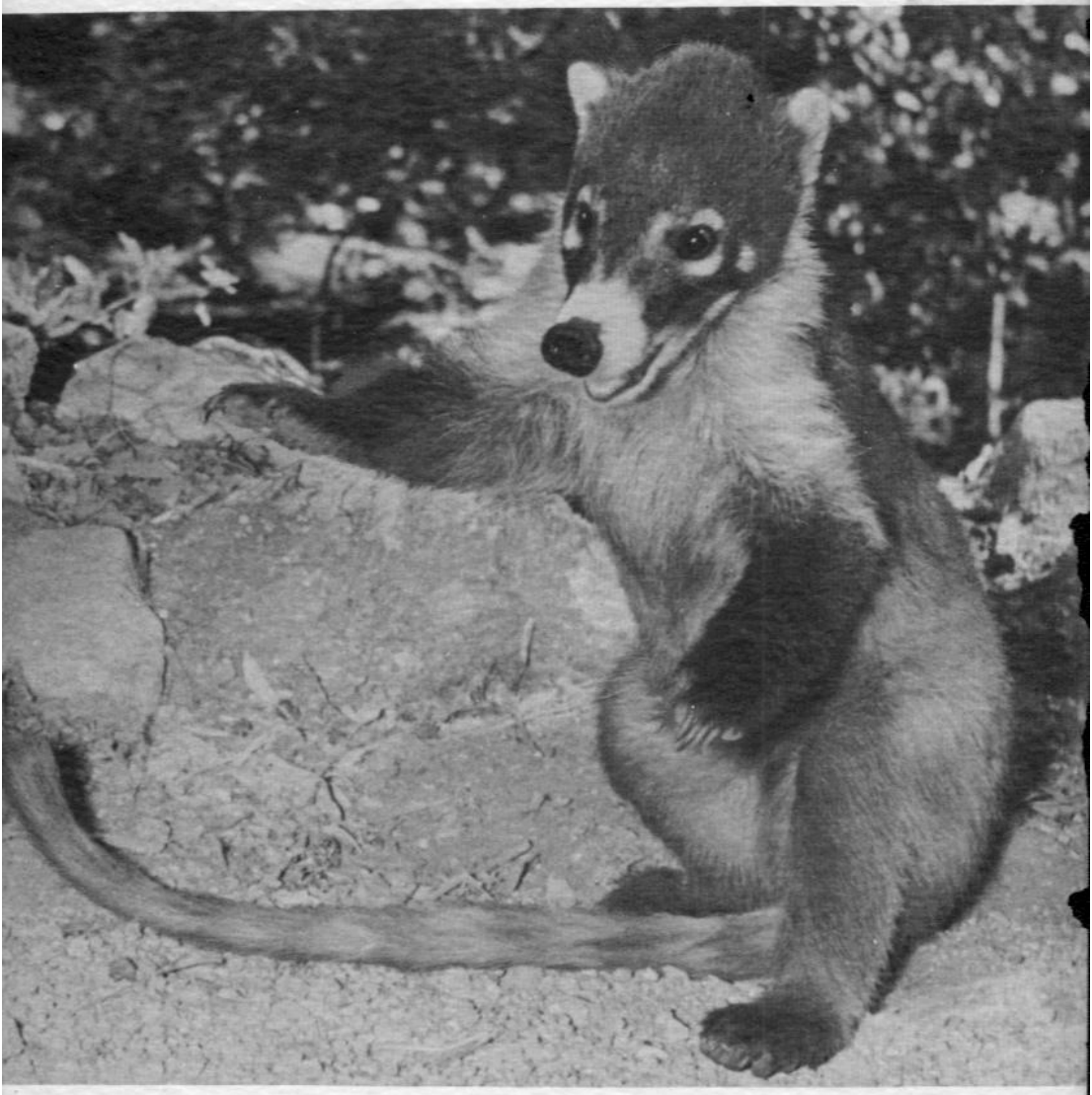
The chagrined Clel said, "Well, look out for old Red—he'll ruin that *chula,*"—and the raw-boned Red received the same treatment, and he too backed away with a bewildered air. Later we made motion pictures of the coati climbing all over the supposedly vicious fighters; the hounds with eyes half closed as the wild pet chewed at their ears and jowls. And just the next day these same animals treed a big male Mexican cougar more than seven feet long! The illustrations show the clown-like posture of the coati as it boxed with the dogs, and one of his victims. Both were made with the speed light fastened along side the Exakta, and both hand held. The speed of the flash satisfactorily stopped action in the fast-moving *chula,* while it served merely as fill-in light with the dog in order to get softness of expression, and to eliminate heavy shadows.

Big game animals in the wild do not make satisfactory subjects for the most part, simply because it is rarely possible to get lights close enough. Excellent results may be obtained with mammals in zoological parks, or under control however, and the strobe is especially useful to eliminate shadows and to bring out facial expressions. The acompanying illustration of the mountain bobcat is an example of such usage.

LION HUNTER
One of Clel Lee's sad-eyed hounds

Photograph by Alfred M. Bailey
and Robert J. Niedrach
Kine Exakta V 35 mm.
50 mm. Zeiss Tessar

It would be possible to continue indefinitely with examples of the value of high-speed flash in nature photography. Equipment is constantly being improved, and the many satisfactory outfits which are now available will be followed by others more powerful. No two people have the same problems, or the same interests, so it is up to the individual to choose cameras and electronic equipment to fit his particular needs—to experiment and to find for himself the best means of operation. Truly a new photographic field has been opened.



Photograph by Alfred M. Bailey
and Robert J. Niedrach
Kine Exakta V 35 mm.
50 mm. Zeiss Tessar

COATI
Nasua narica pallida
The mischievous chula made life miserable for the ranch dogs