TWO ABERRANT GOLDFINCHES

by William E. Davis, Jr.

In December 1987 my father, William E. Davis of West Boxford, Massachusetts, told me that an albinistic American Goldfinch *(Carduelis tristis)* had been coming regularly to his thistle feeder since mid-November. The bird continued to be a regular, usually daily, visitor, and in early January 1988 I was able to photograph it on the thistle sock.

This "albino" goldfinch had an orange beak and pink legs, a yellow wash on the face and throat, and a dusky forehead. Its eyes were dark. The remaining plumage was entirely white except for several tail feathers and several primary and secondary wing feathers. The black feathering was bilaterally symmetrical.

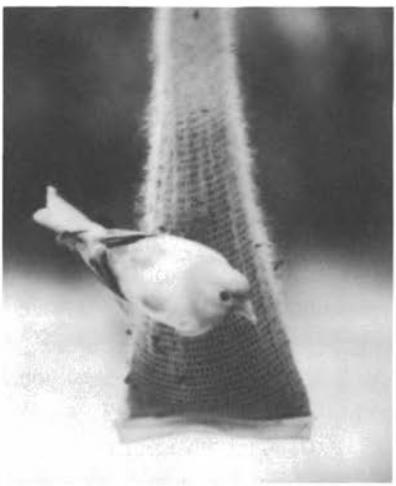
The bird was not an albino, since albinism is the complete absence of pigmentation throughout the plumage and soft parts. Nor can the bird be properly described as a "partial albino." Buckley (1982) very cogently explained why this term is inappropriate: "Albinism is all or nothing, and a bird can no more be a 'partial albino' than a female mammal 'partially pregnant.'" What then is the proper designation for the plumage of this bird? Following Buckley's classification (1982), the bird was *leucistic* and hence, a *leucino*. Leucism involves the loss of particular pigments. The inheritance of leucism may be controlled by several different gene loci. Birds may be leucistic in some feather areas, but not others, producing the patchy coloration found in this bird. Thus, the bird appears to show symmetrical, partial nonmelanic leucism.

The distribution of different melanins may be controlled by different gene loci. When one or more pigments usually present in a bird's plumage is absent, the condition is called *schizochroism*. Frequently, dark colors in bird feathers are the result of two melanins overlying each other. If one melanin is absent and the other expressed, the condition is nonmelanic schizochroism.

Several carotenoid pigments may be present in goldfinches. All may be missing in this bird except those in the face and throat. This would be termed noncarotenoid schizochroism. Alternatively, in winter plumage the bird's face and throat may be the only location for carotenoid pigments, the rest of the brownish plumage resulting from melanins. Perhaps this individual had more than one pigment abnormality. As Buckley (1982) states:". . . plumage aberrancies of more than one type frequently occur in the same individual, indicative of a genetic defect underlying, or common to, several pigmentation systems." These multiple defects could result from multiple mutations or, more probably, from translocations where gene loci are shifted on the chromosomes. The bird might be considered a symmetrical, noncarotenoid nonmelanic schizochroic, partial nonmelanic leucino, or as Buckley suggested with tongue in cheek—a "partial leucino with complications." Occurrence of these abnormalities is infrequent in cardueline finches (Phillips 1954), but Buckley (personal communication) reports that they are not uncommonly reported in the caged-bird literature.

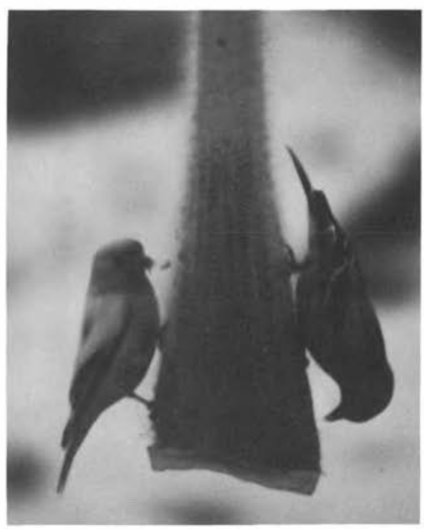
A second goldfinch, also present at the same feeder, appeared to have either molted only partially into its winter plumage or begun an extremely early molt into its breeding plumage. This "breeding-plumaged" bird had a somewhat piebald appearance with patches of gray feathers in the otherwise typical yellow feathering.

In the Canadian population studied by Middleton (1978), goldfinches begin to acquire their winter plumage (postnuptial or prebasic molt) in mid-August and complete it by late October to early November. Hence, it seems unlikely



Leucistic goldfinch

Photos by William E. Davis, Jr.



Two aberrant goldfinches: leucistic (left), "breeding-plumaged" (right) that a bird in mid-November could have acquired a winter plumage and then molted again into breeding plumage (prenuptial or pre-alternate molt). The most likely situation thus appears to be a delayed (arrested) or missed molt. I found few references to this phenomenon in the literature, but see Pitelka (1961) on a Steller's Jay. I also found references to missed or delayed molt in a Black Guillemot and Long-billed Curlew in letters of Ludlow Griscom. Buckley reports, however, that arrested molt is not all that uncommon (see below). In many birds the administration of sex hormones slows or arrests the normal course of molt, and changes in food supply have caused interruption of molt in some captive birds (Payne 1972). American Goldfinches have interesting molt patterns since they are the only cardueline finch to acquire winter plumage by molting body feathers (Middleton 1977), and in the subspecies *salicamans* from southern California, individuals often show suppression of the prenuptial molt, some never molting into full breeding (nuptial or alternate) plumage (Bent 1968).

What produced the aberrations in these two goldfinches, and why did they show up at the same feeder? In an attempt to find out more about both the yellow bird and the leucino, I sent photographs of the birds to Dr. P. A. Buckley at Rutgers University, New Brunswick, New Jersey, and Dr. Alex L. A. Middleton of the Department of Zoology, College of Biological Science at Guelph University in Ontario, Canada. Dr. Buckley is an authority on avian genetics, and Dr. Middleton, on the molt of goldfinches. His 1978 paper, for example, reported molt data from over thirty-five hundred banded or collected American Goldfinches.

Printed below are major excerpts from Dr. Buckley's and Dr. Middleton's letters.

Buckley:

> What I suspect is happening in the white bird is leucism on the bulk of the body feathers that may involve only phaeomelanin (the lighter brown) leaving only the black eumelanin on the primaries and smudges of it elsewhere on the body. My guess would be that winter plumage in *tristis* may be largely (except possibly for the head area) the result of two melanins interacting. Then in breeding plumage carotenoids are secreted into that feather generation, interacting with or replacing one or both melanins to give the typical breeding plumage. What, then, about the yellow face and throat? This may be normal winter carotenoids that have been uncovered by the schizochroism operating on the bird's entire body. . . . The bright bill color clearly bespeaks some sort of hormonal or photoperiod problem [or both], and that in turn could be what triggered the abnormal deficiency of phaeomelanin. It is even possible that the

pink bill is also a schizochroic manifestation. . . . I suspect that both these birds might be siblings sharing a similar or related genetic defect or were in some way affected by an abnormal photoperiod—maybe even by something as mundane as roosting in an area where they were exposed to lights at night. That's all it takes to induce photoperiodic disruption. . . .

As to the yellow bird, arrested molt in my experience is tolerably common as aberrancies go—I have seen more than a few over the last forty years. It is certainly inducible by abnormal photoperiods and quite possibly also by abnormal diet. Lastly it could be genetic, and because of that, again, both birds might be siblings.

Middleton:

1. I notice that the bill, at least of the albinistic bird, is full orange. There is a hint of colour in the bill of the second bird as well.
2. The yellow individual, judging by the white on its primaries that extend beyond the coverts, is a bird in SY (second year) condition.
3. The plumage of the yellow bird has a piebald appearance that is intermediate between a full winter and full summer plumage condition.

From these bits of evidence I sense that both birds are likely aviary escapees, from the same aviary. The fact that two such unlikely birds would show up at the same time is remarkable. This in turn suggests that they knew each other and were traveling together in company. I suggest that both birds were held under a regulated photoperiod and temperature. This I deduce from the orange bills which indicate well developed gonads, if not full breeding condition. Third, the mottled plumage is virtually identical to that developed by one of my birds held captive for two and a half years. The latter was held under natural photoperiods but under "constant" temperatures of about 20° C. This bird moulted, but never completely, and always had a yellow olive plumage that was very similar to the bird in question. Thus, there is more reason to suspect your bird escaped from similar conditions, where light could have been manipulated to stimulate song or breeding and where the temperatures were probably considerably higher than ambient.

The plumage condition of the yellow bird I would describe as being intermediate between basic [winter] and alternate [breeding] plumages. The drab feathers are certainly not worn ones and do appear typical of the basic plumage. The fact that the SY primaries have not been shed suggests to me that the bird did not complete its fall (prebasic) moult. Thus I suspect arrested moult. However, recall that in two and a half years of captivity, my bird showed no clear-cut basic or alternate plumage; instead it retained an "intermediate" plumage throughout.

I hope this may shed some light on your query. It is certainly a fascinating case. It further points out to me the need for successful controlled moult studies on this species.

I wish to thank P. A. Buckley and Alex A. L. Middleton for examining the goldfinch photographs, for allowing me to quote from their letters, and for reviewing earlier drafts of the manuscript. Their comments elucidate the many facets of avian color determination and molt. Both noted the possible involvement of photoperiodicity, the probable common origin of the two goldfinches, whether genetic or from the same aviary, and the possibility of arrested molt. Although their interpretations of the origin of the birds differ, this nonetheless provides an interesting example of how experts from diverse fields, examining the same evidence, may arrive at common ground.

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