Canary Culture
Concepts in Genetics
Part 2

by Tony Bucci
San Pedro, California

Mutation

In part I of this article we learned the basics of biological mechanics and terminology dealing with reproduction. Also, we learned that the DNA in the genes determines what the canary will look like.

The many variations among animals led scientists to conclude that DNA does not always copy itself exactly. If DNA had always copied itself, the original green canary would still be the only color in existence. A gene is an extremely stable structure. It may remain stable through many generations, copying itself correctly between each cell division. Occasionally, a mistake occurs in the copying process. A change in the gene is called a *mutation*.

In nature, animals which are well suited to an environment have a better chance of survival. The environment encourages survival of animals with favorable mutations, and works against those with unfavorable mutations. This process is called *natural selection*.

In captivity, breeders of animals preserve mutations even if the mutation is unfavorable. One good example is the white canary. The white canary can never become established in its natural habitat. Among green trees, its white color is poor camouflage, and so the white canary becomes an easy prey for predators. Therefore, in nature, the white canary is not a favorable mutation. Predators find them easily and nature eliminates them; hence, natural selection.

Figure 1

To the contrary, in captivity, breeders are able to care for and preserve mutations if they so desire. This process is called *artificial selection.*

I have a good example of a recent mutation in my bird room. A good friend called me recently to tell me of a strange Gouldian she has bred this year. It was hard for me to believe what she told me. The bird has two sets of toes on each leg. Altogether this bird has 16 toes. She gave me the bird to take pictures of, and as far as she is concerned, I can keep it for good. I thought it would make a good example for this article. (See figure 1.)

We could establish this mutation if we so desired. Neither I or my friend has the desire to preserve this mutation. Therefore, this bird will become only a recorded example of an undesirable mutation.

Breeders have accomplished what nature may have taken millions of years to evolve, and have created new colors and variations that may have never survived in the wild. By protecting mutations and encouraging their reproduction, mankind has, in just 400 years, developed colors and varieties in animals that would not otherwise exist today.

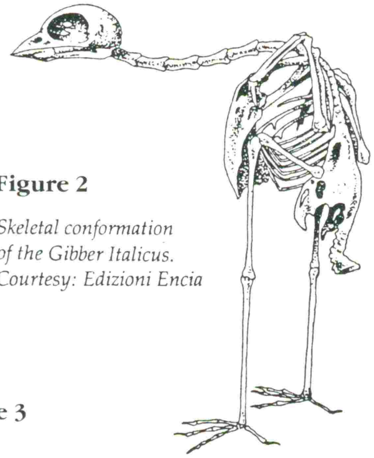


Figure 2

Skeletal conformation of the Gibber Italicus. Courtesy: Edizioni Encia

Figure 3

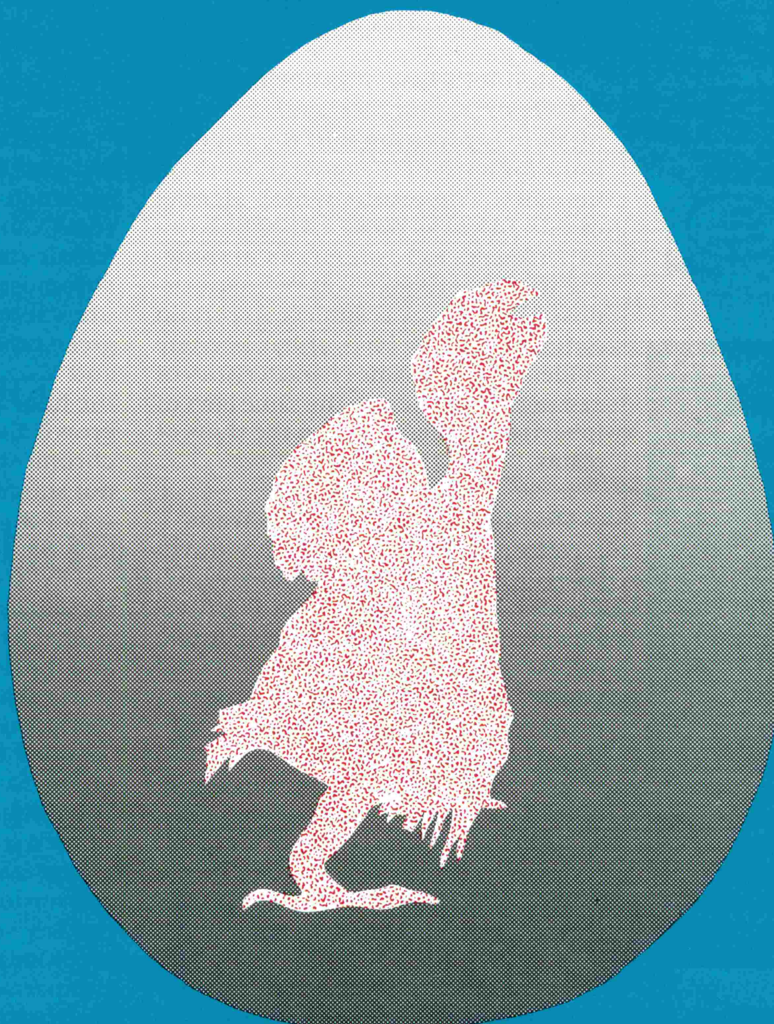
Evolution

Modern explanation of evolution dates from 1859, when Charles Darwin published *The Origin of Species.* It was Darwin who explained *natural selection* and compared it to *artificial selection.* In the process of artificial selection, breeders choose animals with variations, and save and breed them through many generations. They produce new varieties as distinct as Gibber Italicus, Gloster, Border or Norwich canaries.

I like to use Gibber Italicus as an example. Skeletal conformation of the Gibber Italicus is somewhat different as compared to other canaries. The difference was not a sudden mutation, but a gradual transformation induced by many years of selective breeding. The continuous selective breeding made it possible for a gradual lengthening of the cervical column, forcing the neck to bend down with respect to the body. It is interesting to note, the lengthening of cervical column did not increase the number of vertebrae; instead each vertebra increased in length. (See figures 2 and 3).

Continued on page 34

THE NEXT GENERATION HAS ARRIVED



An advanced *new* food morsel designed and manufactured just for Psittacines.

Available in new cheese and apple flavors.

Call toll free **800-327-7974.**

"Birds eat it and like it"

MARION ZOOLOGICAL INC.

113 N. First
in KS.
(316) 382-3734

P.O. Box 212

(800) 327-7974

Marion, KS 66861

VISA MasterCard

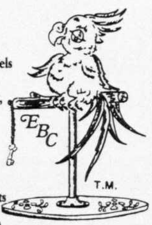
EMERALD BIRD CADDY

WHERE BIRD STANDS ARE BEAUTIFUL TOO!

- ★ Portable Bird Stand to carry your bird in the house or in the car.
- ★ Attractive and colorful non tip base. No papers, nothing to spill.
- ★ Beautiful tiles just wipe clean. Many color designs to choose from.
- ★ Disinfected and dried oak perches for healthy feet.
- ★ Safety chain and bone toy for a busy beak.
- ★ Sturdy construction, no nails or sharp edges for a safe playtime.

for COLOR CATALOG and ORDER INFO.
call (503) 345-2548

or write
Emerald Bird Caddy
28767 GIMPL HILL
EUGENE, OR 97402



sizes

SMALL: fits Budgies, Small Conures, Cockatiels
* 14.95 *

MEDIUM: fits Conures, Senegals, Timnehs
* 19.95 *

LARGE: fits Amazons, Cockatoos, Greys
* 24.95 *

EXTRA LARGE: fits all Macaws, (Need overall size of bird.)
* 34.95 *

Replacement perches and bone toys available. Packaged and sealed for your birds protection.

Order perches by stand size.

Small, Medium, Large, and Extra Large. (Madrone Perches on request). $1.49 ea.

Holes drilled and ready to mount.

Bone Toys .99 ea. Hooks included.

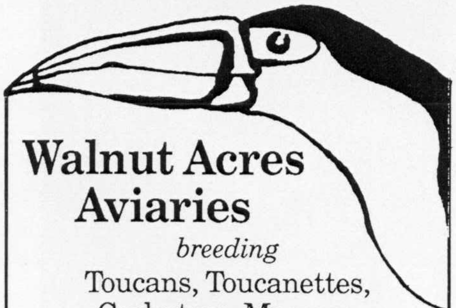
Price Includes Shipping

DEALER INQUIRIES WELCOME

AVIARY & ANIMAL PET SUPPLY
P.O. Box 514
Fort Towson, OK 74735

Three Types Automatic Watering Systems, J-Clips, J-Clip Pliers, Flush Ground Cutting Pliers, Pop Bottle Water Founts, Plastic & Metal Feeders, Metal Trays, Breeding & Flight Cages, Parrot Stands & Cups, Incubators, Ketch-All Mouse Traps, Electric Foggers, Automatic Light Timer, Kool Mist Foggers, Medications, Vitamin & Mineral Supplements, Books, Nylon Corner for 1" × 1" Steel Tubing, Canary Nests, Canthaxanthin for Red Canaries, *Much More.*

Send $1.00 for Illustrated Catalog #3 by First Class Mail.



Walnut Acres Aviaries

breeding

Toucans, Toucanettes, Cockatoos, Macaws, Eclectus, African greys, Australian parakeets, Parrots and Finches

All Birds Closed Banded

Call or write for price list: Jerry Jennings

(818) 884-5476

P.O. Box 6393, Woodland Hills, CA 91365

Visitors by appointment only.

Continued from page 32

All of the type canaries have evolved by continuous selective breeding. To the contrary, most color canaries evolved from a sudden mutation, such as agate, brown, Isabel, white, opal, ino, satinette, ivory, and pastel. Red factor canaries evolved by crossing a canary with the black-hooded red siskin from Venezuela. This is not a mutation but a hybridization.

Mendel's Law of Inheritance

Gregor Mendel's experiments in plant hybridization laid the foundations for most of the modern work on heredity. The results which Mendel obtained from these hybridization experiments were important in showing that inheritance was not a hit-or-miss affair but was subject to certain definite rules or laws. It has become evident that the same characteristics of canaries are subject to the same laws of inheritance which govern the traits of plants.

Dominant and Recessive Traits

When Mendel crossed a pure-breeding red-flowered (homozygote) plant with a pure-breeding white-flowered one, the progeny were found to resemble exactly the red-flowered parent. No white-flowered plants and no intermediates appeared. In the subsequent generation, white-flowered plants cropped out again. But in the hybrid itself, whiteness seemed to be suppressed or to recede from view and redness to dominate. Mendel, therefore, called such a trait as redness of flowers a *dominant* one and such a trait as whiteness a *recessive* one.

All of the characteristics in peas reported by Mendel behaved in this way, one being dominant over another. Thus, the round form of seed was found to be dominant over the wrinkled, etc.

Canary breeders have found that various canary traits behave in the same manner as did the plants for Mendel. One good example is when mating a pure-breeding male green canary to a brown hen, you obtain all green progeny. Here we can see that the green is dominant over brown, and brown is recessive to green.

In order to formulate the concept and to form a mental picture of recessive vs. dominant, we must use some sort of diagram. The one I have chosen to use is the "Punet Square." I feel it is the easiest to visualize, and I will use it for all of the diagrams representing different matings.

Figure 4

	Xb	Y
XG	XG Xb	XG Y
XG	XG Xb	XG Y

In part I of this article (previous issue of *Watchbird*) we learned that each cell within the male canary has two (XX) sex chromosomes, and the female canary has one (X) and one (Y) chromosome. The Punet Square in figure 4 represents the mating of a male green canary and a brown hen. The Xb and Y on top of the square represent the hen. The small letter "b" denotes brown and the recessive nature of the chromosome. The Y chromosome is not sub-labeled as it denotes only the sex of the canary, and is often referred to as the empty chromosome.

The XG and XG on the left side of the square represents the male. The capital letter "G" denotes green color and the dominant trait of the chromosome. Thus, a capital letter denotes dominant trait and small letter denotes recessive trait.

The four small squares within the large square denote each offspring. The two males are phenotypically green, and genotypically green and carriers of brown. Let me expand on the last sentence. The two males are green in appearance, but different in comparison to their father. The father is a *homozygote,* or pure Green (both chromosomes carry green). The two young are Green and carriers of Brown *(heterozygotes).* One chromosome which is inherited from the father carries green. The other chromosome which is inherited from the mother is brown. The green is dominant over brown; therefore, the canary will appear green in color.

The two hens are phenotypically green. They inherited only the green chromosome from the father. The "Y" chromosome does not carry anything. Genotypically, the two hens are homozygotes (pure green).

The above explanation is a typical sex-link dominant and recessive characteristic which will be further explained in the next *Watchbird* issue.

This concludes Part II of this article. Part III will follow in the next issue. ●