STAMP STORIES

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In this article, I will continue the practice I started in the last issue by telling the story of another stamp that is interesting to me. I have found that if you have an inquiring attitude and really look into any subject, you can always find something about it that is intriguing. I just returned from an extended stay in the Southwest where our team worked in a desert area that was cold, windy, dusty, and desolate—in other words, unpleasant. On one frustrating day, I remarked that perhaps the local motto, "Land of Enchantment," meant that you had to be under some evil spell to live there. But my colleague, who was on her first visit to the area, pointed out to me the beauty of the desert sunrises as we headed to work and the stunning, colorful mountain vistas. This caused me to realize how our attitude affects our outlook and reminded me that, of the many places I have traveled, I have always found something about them that was fascinating, and the same is true of philatelic items.

On 15 September 2001, agents purporting to represent Liberia flooded the stamp market with a series of stamps, miniature sheets, and souvenir sheets showing "Butterflies of the World," together with myriad other subjects. In 2001, Liberia was in the middle of a civil war that basically closed down postal operations. In line with their policy, the Scott Catalogue does not list Liberian items from this period because all were produced by overseas agents operating under pre-war contracts, and apparently none of the issues were available in the country for use even if the mail had been operating. Other catalogs such as Stanley Gibbons follow this same course.

It is unfortunate that these items are unrecognized as official, because they include a souvenir sheet that contains the only postal item of which I am aware showing an unusual and spectacular genetic aberration known as *gynandromorphism*.

Gynandromorphs exhibit the external characteristics of both the male and female in the same individual. The term derives from the Greek root words *gyne*, meaning woman or female; *andro*, meaning man or male; and *morph*, meaning shape or form. These are the same roots from which, in reverse order, we get the word androgynous. One reason I know this etymology is that, during one summer quarter in college, I took a course from the Greek Department in order to gain some elective credits. In those days, the hours spent in ROTC, did not count toward my engineering degree, so I enrolled in a class titled, "Words in English," where we studied the derivation of many words from their Greek source. It was a very interesting class made more so by an enthusiastic instructor and the fact I was the only male among the seven students.

Now back to our subject. This sheet contains one $100 stamp with an image of a butterfly that looks like someone took the wings from two different species to make up some sort of weird Frankenstein creature. The label on the stamp calls it "*Morpho aega*," and indeed that is the name of the species shown. However, you could look long and hard and you would never find another one looking like this because these forms are so rare and unique. Of course, this makes them highly desirable for collectors.

Lepidoptera are not the only organisms that exhibit this abnormality, but they provide some of the most striking examples because many species show significant sexual dimorphism, or a widely different appearance between male and female specimens. Gynandromorphism exists in other insect orders and has also been found in birds and crustaceans.

There are two basic types of gynandromorphs. The rarer type shows complete bilateral symmetry. That is, one half looks entirely female, while the other half looks entirely male as shown in the *Papilio dardanus* specimen at right. Although still very rare, most forms exhibit an unequal mixture of both male and female traits and these are known as mosaic gynandromorphs.

Some people mistakenly call these forms hermaphrodites, but that is not the mechanism at work here. In order to understand how these genetic anomalies occur, you need to know how sexual characteristics are formed in the Lepidoptera. As we learned in biology, sexually reproducing organisms begin existence as a single cell, a zygote, which is a fused sperm and egg cell. This cell then repeatedly divides, eventually making all the different cells in the body. At some point, each cell differentiates from the others and its development becomes determined so that it ends up as bone, muscle, or other form.

In mammals, the early stages of cell division are indeterminate. That is, the cells can develop into any form. But in insects, the division is completely determinate, which means that the decision about what a cell will become is made with each division. For example, the first division determines the left and right sides so that when the zygote splits into two cells, the entire right side will develop from one and the left side from the other. This sort of determination occurs with every subsequent division. The second division determines front and back, the third top and bottom, and so on.

It may surprise some to know that in the Lepidoptera, the female determines the sex of the offspring, because she possesses the XY chromosome combination. However, it is not the presence of a Y chromosome that determines sex *appearance*. It is the quantity of X chromosomes in the cell. Any cell with two X chromosomes will be male. Any cell with less than two (i.e., XY or X alone) will be female.

One way a bilateral gynandromorph can develop is from an egg that has two nuclei, one X and the other Y, both of which become fertilized and result in two sexually opposite halves. This is extremely rare. The other way is if an error occurs in the first cell division of a male embryo so that one cell loses an X chromosome. One half will be normal male (XX) and the other half X, which is effectively female. Mosaic gynandromorphs typically result when the loss of an X chromosome occurs later on in the cell division sequence. And this can happen independently several times.

Mosaic gynandromorphs can also form from female embryos, but here is where it gets tricky. In some cell divisions something goes wrong and the cell can wind up with either a missing or an extra sex chromosome. In these cases, you can have XXY or Y alone configurations. Any cell with a single Y will die, but XXY cells are viable and they will appear male because they have two X chromosomes. The rest of the insect with normal XY cells will be female.

Regarding the specimen shown on our souvenir sheet, the males of *Morpho aega* are normally an iridescent blue, but the females occur in two color patterns, orange-brown and blue. The souvenir sheet actually shows a blue female in the top margin. The gynandromorph on the stamp is a male with a female mosaic pattern. The right forewing is the orange-brown female pattern. The right hind wing is mostly the orange-brown female design with a small patch of the blue male color at the top edge. The left forewing is entirely the blue male pattern, while the left hind wing is a mixture of the blue male and orange-brown female forms.

In addition to gynandromorphism there is another phenomenon that can cause individuals to have a sexually intermediate appearance known as *intersexuality*. In these cases, which involve only females, the cells all have the normal XY chromosome combination, but the influence of the X chromosome partially overcomes the influence of the Y chromosome. This can occur with a mating of two separate races where the "dose" of the X from one race is stronger that the normal X from the other. In this case, a single X from race A may be equivalent of two X chromosomes from race B. It is remotely possible that the blue females of *M. aega* shown on our sheet are intersexual in origin. The difference in colors between these and the normal females is structural from a male influence and not due to pigments.

Well, I am sure this is more than you ever wanted to know about the genetics of butterflies. However, keep on the lookout for any of these oddities. If you can capture one, it is highly valuable. No need to worry about their protection. They will not be reproducing because almost all of them are sterile.