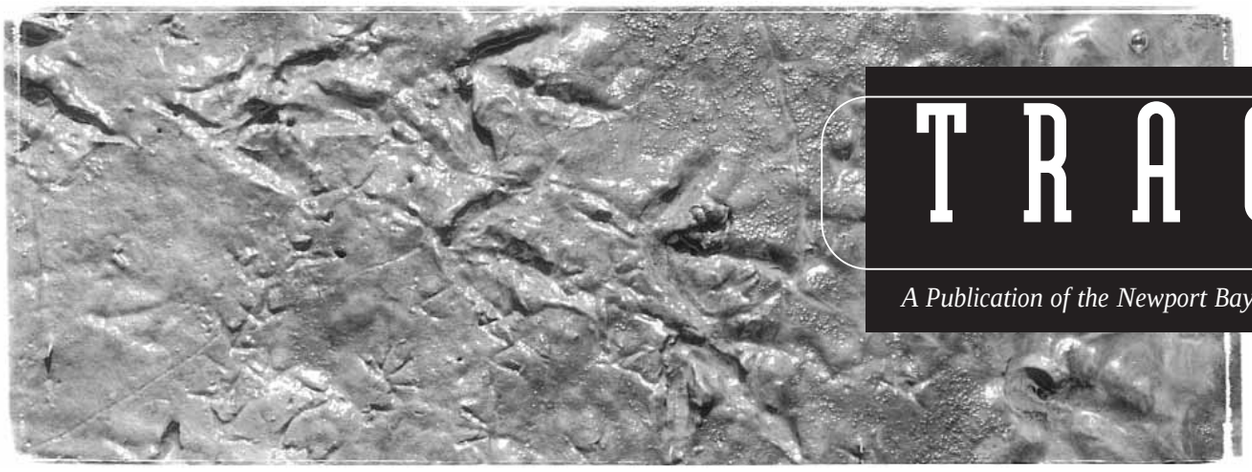

TRACKS

A Publication of the Newport Bay Naturalists & Friends

June–August

2008

Butterfly Wings

In Orange County we have about 70 species of butterfly. Many butterfly species are amazingly specific in their requirements for a larval foodplant, and the adults will lay their eggs only on the appropriate plants. In fact, finding the right foodplant is often the best way to locate these butterflies. For example, the Mourning Cloak will be found flying in riparian areas where its larval foodplant, willow, is found. This butterfly is also unusual in that the females lay their eggs in tight clusters, which makes them easier to find than for species that lay their eggs one at a time.

Scientists as well as collectors are fascinated by the spectacular color patterns of butterfly wings. We wonder not only how these amazingly diverse patterns form, but why?

How the patterns form is a major unsolved problem in developmental biology. We know that they form well before we can see them - in structures called the imaginal discs of the caterpillar and the pupa. These imaginal discs wait until the animal goes through metamorphosis to develop the pigmentation that defines the adult pattern.

It is believed that the individual parts of the pattern—the stripes and spots that we call pattern elements - are positioned by the action of unknown substances that form concentration gradients in the imaginal discs. Cells in the wing tissue are able to sense the local concentration, and translate that information into instructions about which pattern elements to produce. The complex patterns may result from the operation of multiple gradients acting in coordination with each other.

Although the pattern may be generated from smooth concentration gradients, the final pattern is digital—the wing surface is covered by thousands of scales, arranged in regular parallel rows on the wing surface. Each scale is about a tenth of a millimeter in size, and is made by a small clone of cells. The scale is usually of only one color, caused by reflection of light from a specific pigment. Some pigments in butterfly wings are fluorescent, absorbing light at one wavelength and emitting it at another.

Some colors from butterfly wings are produced not by pigments but by nanotechnology. The surface of the scale is a submicroscopic structure that scatters some wavelengths of light but amplifies others, a phenomenon called iridescence, and this produces the brilliant blue flashing light from the morpho butterflies in tropical forests. The wings of some butterflies have remarkably similar structures to the high-efficiency light-emitting diodes (LEDs) that engineers invented and that we now see on all of our electronic devices.

But why do butterfly wings have such spectacular patterns? One possibility is that these patterns are needed for mate recognition. Perhaps butterflies need those patterns in order to recognize their own species, even from a distance, for courtship and mating. In some species the wing pattern may also advertise the gender of the individual - the males and females are sometimes very different from each other, as in our official state butterfly, the California Dogface, where the male but not the female carries a picture of a French Poodle on each forewing.

We have to remember that butterflies probably look very different to butterflies, because unlike us they can see in the ultraviolet part of the spectrum. Males of the orange sulfur butterfly and its relatives have strong reflectance in the ultraviolet, and females are attracted to the males with the brightest UV reflectance.

Another function of color patterns on animals is camouflage, but the bold patterns and colors of most of our butterflies make them more, rather than less conspicuous, so they are clearly not for camouflage. However, the pattern on the underside of the wing is often more muted than that on the upper surface and could function in camouflage when the butterfly is resting with its wings folded. Our three local ladies, the Painted Lady, the West Coast Lady and the Virginia Lady all show this upper-lower difference.

Species with extensive black color on the wings may be able to absorb heat and stay warm on cold days. Consistent with this idea some species, including our Orange Sulfur butterfly, have different seasonal forms - a darker form that emerges in the cooler spring season and a lighter form that emerges in the summer.

Some of the really bold patterns on butterfly wings may have evolved to warn predatory birds that the insect is poisonous, or at least distasteful, due to the accumulation in its body of chemicals that were taken up by the caterpillar feeding on poisonous plants. The monarch butterfly, where the caterpillar feeds on milkweed loaded with toxic glycosides, is the classic example of this. The warning pattern is so successful that a butterfly in another family (the Viceroy) has evolved a wing pattern to mimic the monarch, thus presumably gaining protec-

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NBNF Mission:

- To ***preserve*** and ***restore*** the ecosystems of Upper Newport Bay.
- To ***educate*** the public about the ecological value of the Bay and its watershed and help ensure compatible public use.

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Newport Bay Naturalists & Friends

Global Warming

The volume of information on global climate change is enough to keep you clear of your TV for weeks. Internet sources are an incredible resource. The amount of information available there and elsewhere may be as overwhelming as the problem at hand. To get you started—or keep you going—this 2-part series in Tracks will provide an overview and examine projected impacts to humans and wildlife.

Climate scientists are increasingly concerned over the current rate of global climate change, which is exceeding natural variations in climate occurring over the last 1,000 years. Before this period, the atomosphere contained about 280 parts per million (ppm) of carbon dioxide (CO2) a natural greenhouse gas. Then people started burning fossil fuels, and the number began climbing. In the late 1950's, when measurements began, it had already reached 315 ppm. Now, it's at 380. And increasing by roughly 2 ppm annually.

Over the last few years, efforts have been made to identify the critical threshold—that point where catastrophe looms. For instance, reports indicate that 450 ppm of CO2 is a level to respect. Other studies are more conservative, believing that levels of 350 are too high. Europe and Japan are already striving diligently to trim their carbon emissions. Emissions produced by the United States, which produces 1/4 of the world's total, continues to rise. India and China are contributing more significantly than ever; China, for example, is currently in the midst of a coal-fired power plant building spree.

Other human activities contribute to climate change, too, such as slash-and-burn agriculture, and land-use changes like deforestation and timber harvesting. There are many variables in play, and the models reflect this.

Global climate change is affecting precipitation patterns, and increased frequencies of extreme weather events, such as floods, droughts, and storms. Sea levels are rising as ice sheets and glaciers melt, and as ocean volume expands in response to higher temperatures. Several communities have already been relocated, something that will become increasing common, and expensive.

The phenomenon is a catalyst for rising costs for human health, the global economy and the Earth's life-supporting ecosystems. Disease vectors such as mosquitoes that carry West Nile virus and ticks that carry Lyme disease are serious concerns. Lyme disease, the most widespread vector-borne disease in the U.S., will expand its range in North America as winters warm and ticks proliferate. Models project that tick habitat will quadruple by the 2080's. Other studies also show that ragweed pollen and some fungal growth is stimulated by increasing levels of carbon dioxide, contributing to the rising prevalence of asthma.

Climate change is also impacting biological diversity, though the impacts will vary between different geographical regions. It is likely that there will be significant changes in the distributions of many plant and animal species. Entire vegetation zones can be expected to shift towards the poles and/or to higher elevations. Additional impacts:

- Egg-laying, flowering, and spawning is occurring earlier for many species, disrupting cycles that ensure availability of food for young animals.
- Spring migration is occurring earlier and fall migration later in many species.
- Pest outbreaks are increasing in frequency and intensity.
- Proliferation of invasive species, and their expansion into wider areas, is increasing.
- Alterations to fire regimes are occurring; virtually all climate change scenarios predict increases in wildfire in western North America.

Biodiversity underpins the ecological processes which make life on Earth possible. The challenge of reversing the degradation of ecosystems while meeting increasing demands for services will involve significant changes in policies, institutions and practices. As an example, since deforestation and land-clearing activities emit about 1.7 metric tons of carbon per year into the atmosphere, conservation of forests is vital. They contain approximately 80% of all carbon stored in terrestrial vegetation. Also, preventing and/or mitigating for habitat fragmentation may aid plants and wildlife in coping with some of the changes underway.

To know global warming, master the vernacular. Learn terms like albedo, climate feedback, black carbon, and thermal expansion. As Alexander Pope once said, a little knowledge may be a dangerous thing. But by learning about this topic, individuals and nations can engage in a dialogue and build consensus. Solutions are out there. There is reason to hope that future generations can enjoy a healthy lifestyle if we act appropriately, and soon.

In the next issue, we'll delve into the impacts of global climate change on coastal and oceanic areas in California and worldwide. We'll examine what the lead agencies are doing—the County of Orange, the Department of Fish and Game—and how California stands out in addressing what may be one of the greatest challenges ever to face mankind.

Amy Litton, Naturalist

Recommended Sites for further study:

1. http: / / www.eea.europa.eu / themes / climate / faq
   Fact sheet from the European Climate Agency
2. http: / / chge.med.harvard.edu
   Harvard Medical School to promote awareness of the human health consequences of global environmental change.
3. http: / / www.climatescience.gov / about / default.htm
   U.S. Government Climate Change Science Program. Worthwhile links.
4. http: / / library.thinkquest.org / 26026 / index.php3
   Site covers many aspects of the environment and provides interactive features.
5. http: / / www.un.org / climatechange
   Gateway to the U.N. System's Work on Climate Change
6. http: / / www.chemistryland.com / CHM107 / GlobalWarming / GlobalWarming.html
   Visually-oriented tutorial. Home page of CHM-107;Chemistryland
7. http: / / www.globalwarmingcalifornia.net
   California Climate Change & Energy: Education Resources Catalog
8. http: / / kids.yahoo.com / directory / Science-and-Nature / The-Earth / Environment / Global-Warming
   For children, more advanced links.
9. National Geographic "Strange Days on Planet Earth, Season II"
   http: / / www.pbs.org / strangedays for purchasing information
10. *Field Notes from a Catastrophe: Man, Nature, & Climate Change;* Elizabeth Kolbert

Upper Newport Bay Calendar of Events

June–August 2008

Steward Days—Every Wednesday, 9:00–11:00 a.m.

Support the Bay's unique genetics at our restoration sites by collecting seeds & propagating plants. Learn how to grow natives in your backyard, attract wildlife and conserve water. For information call (949) 640-0286. Location code: BBSC

Kayak Tours—Every Saturday, 10:00 a.m.–Noon at the Dunes

Join a trained naturalist for a guided kayak tour of the Back Bay. Meet at the Newport Dunes Resort. $15/person, 8 & up. $10/NBNF members. Be prepared to get wet. Reservations (949) 923-2269. Location code: NDR

Kayak Tours—Every Sunday, 10:00 a.m.–Noon at the NAC

Join a trained naturalist for a guided kayak tour of the Back Bay. Meet at the Newport Aquatic Center. $15/person, 8 and up. $10/NBNF members. Be prepared to get wet. Reservations (949) 923-2269. Location code: NAC

Walking Tour—Saturday, June 7, July 5, Aug. 2, 9:00 a.m.

Join a trained Naturalist for a 2 hour walk along the bay. Bring binoculars and sun protection. Free. No reservations needed. For information call (949) 923-2269. Location code: BBSC

2nd Sundays Restoration Program—June 8, July 13, Aug. 10, 9:00 a.m.–Noon

Join the staff at the MIC to enhance the Nature Preserve habitat with non-native plant removal, native plantings and Butterfly Garden maintenance. Reservations (949) 923-2297. Location code: IC

Twilight Canoe Tour with Barbecue—Saturday, June 14, July 12, 4:00–7:00 p.m.

Join Naturalists and Sea Scouts for a beautiful canoe tour of the Reserve followed by a cookout at the Newport Aquatic Center. Fee is $30. Reservations required (949) 642-5031. Ages 10 and up. Location Code: NAC.

Family Fun Walk—Saturday, June 14, July 12, Aug. 9, 10:30–11:30 a.m.

Join park staff for a guided nature walk through the bay. Explore the beauty of the bay and discuss its rich natural history. Programs take place on various trails. All ages. Registration required. Free. Rain cancels. Phone (949) 923-2275 or email unbic@ocparks.com. Location code: IC

Fishing for Science—Friday, June 20, July 18, Aug. 15, 5:30–8:30 p.m.

Fish for rays, sharks and fish off our dock after a barbeque dinner and a quick preparatory lesson. Fee is $25 per person. Ages 8–16. For information and registration contact the Sea Base at (949) 642-5031. Location Code: BBSC.

Train for a Day, Volunteer at the Bay!—Saturday, June 21, Aug. 16, 9 a.m.–3 p.m.

Become a part of this dynamic estuary! Learn about the habitats and wildlife of the bay. Participate in habitat restoration and special events. Assist with tours. Greet and educate visitors. Registration (949) 923-2275. Location code: IC

Marine Life Inventory—Saturday, June 21, July 19, August 16, 8:15–11:30 a.m.

Marine biology students ages 8 and up are invited to participate in a variety of hands-on marine life monitoring programs in Newport Bay with the Dept. of Fish and Game. Children under 18 must be accompanied by an adult. Free. Reservations (949) 640-9956. Location code: BBSC

Shellmaker Discovery Tour—Saturday, June 21, July 19, August 16, 9–10:30 a.m.

Join a Naturalist to learn about Shellmaker Island's rich history; the future of the Back Bay Science Center; and discover unusual and endangered plants, birds and crab habitats. No reservations required. No latecomers. Free. For information call (949) 640-9956. Location code: BBSC

Shark Camp at the Bay—Saturday, June 21, July 19, Aug. 16, 6:00 p.m.

Learn about the lives of sharks and rays while eating dinner around the campfire. Then help catch, tag and release them off our dock. Fee is $25. Ages 7–16. Information and reservations (949) 642-5031. Location Code: BBSC.

Big Canyon Walking Tour—Saturday, June 21, July 19, August 16, 9:00 a.m.

Join a trained Naturalist for a 2 hour walk along Big Canyon Trail and the bay. Bring binoculars and sun protection. Free. No reservations needed. For information call (949) 923-2269. Location code: Big Canyon parking lot.

Astronomy Night—Friday, June 27, Saturday, July 26, 8:00–10:00 p.m.

Join members of the O. C. Astronomers for an inspirational tour of the night sky including observation with telescopes. Family program. No fee; suggested donation of $2/person. Registration (949) 923-2275 or unbic@ocparks.com. Location code: IC

ROOTS Restoration Teamwork—Saturday, June 28, July 26, August 23, 9:00 a.m.–Noon

Help restore Back Bay habitat by installing and maintaining native plants while learning about wetland ecology. Reservations required. Refreshments, tools provided. (949) 640-0286 for information, reservations and location.

Sunset Stroll—Saturday, June 28, July 19, Aug. 16, start times vary

Join park staff for a 90 minute twilight nature walk and discover the wonders that nighttime brings to our nature reserve. Dress warmly. Rain cancels. $5 per person, age 3 and up. Phone for registration and start time to (949) 923-2275, or email unbic@ocparks.com. Location code: IC

For all of the following, call (949) 923-2275 to register or email unbic@ocparks.com. $5 per child. Location code: IC

Toddler Time (Ages 2–5)

10:30–11:15 a.m. for ages 2–5 years. Join park staff for a parent-child experience with stories, movement and hands-on fun.

Call for details—Wednesday, June 11
"Beetle Mania"—Wednesday, June 18
Call for details—Wednesday, July 2
"Cool Cacti"—Wednesday, July 9
"Tern'in Learning"—Wednesday, July 23
Call for details—Wednesday, August 6
"Starlight, Starbright"—Wednesday, August 13
"Sagey Scents"–Wednesday, August 27

Bayside Buddies (Ages 5–8)

3:30–4:30 p.m. for ages 5–8. Come discover the natural history of the bay through crafts, hands-on activities and nature walks.

"Oceanic Oddities"—Friday, June 13
"Nature's Fireworks"—Friday, June 27
"Endangered in the Estuary"—Friday, July 11
"Take a Hike"—Friday, July 25
"Solar Sizzle"—Friday, August 15
"Fishy Friends"—Friday, August 29

Wild! Tales (Ages 2–7)

10:30–11:15 a.m. Come visit the park staff for story-telling fun. Learn more about the natural history of the Bay through crafts, hands-on activities and nature walks.

Thursday—June 5, June 26, July 3, July 17, August 7, August 21

Conservation Club (Ages 5–10)

3:30–4:30 p.m. for ages 5–10. Come work with park staff to help establish a habitat for UNB wildlife. Learn about the importance of native plants and water conservation. Be prepared to get down and dirty. Free.

Friday afternoon—June 20, July 18, August 8, August 22

Children's Painting Classes (Ages 6–15)

Join a professional SOCALPAPA plein air artist and learn to paint using the Back Bay as your subject. Donations to cover the cost of materials will be appreciated.

July 17, 18, and 19—9:30–10:30 a.m. Ages 6–8
11:00 a.m.–12:15 p.m. Ages 9–11
1:30–3:00 p.m. Ages 12–15

Please see Location Key on Page 4

Newport Bay Naturalists & Friends

Tracks, June–August 2008

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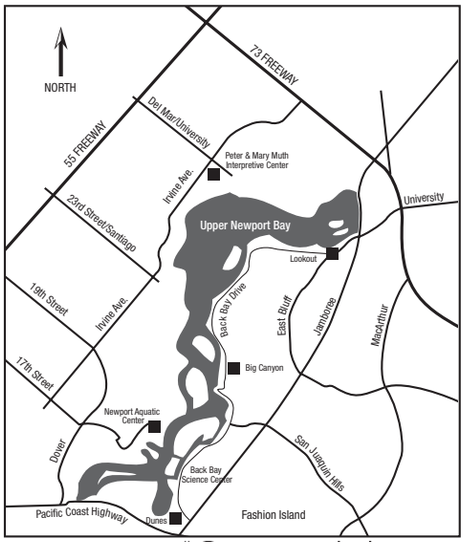

Web Sites

Newport Bay Naturalists & Friends: www.newportbay.org
Peter & Mary Muth Interpretive Center: www.ocparks.com/unbic
Back Bay Science Center: www.backbaysciencecenter.org
California Coastal Commission: www.coastal.ca.gov

Tracks Credits

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Event Calendar: Candice McIntyre, Jean Whitaker

◄ Location Key

Peter and Mary Muth Interpretive Center *(IC)*
2301 University Drive
Newport Beach, CA 92660

Back Bay Science Center *(BBSC)*
600 Shellmaker
Newport Beach, CA 92660

Newport Aquatic Center *(NAC)*
1 Whitecliffs Drive
Newport Beach, CA 92660

SOCALPAPA *Paints Back Bay*

5th Annual Art Show and Sale

Saturday & Sunday
July 26 & 27
10:00 am to 4:00 pm
Muth Interpretive Center
2301 University Drive
(at Irvine Ave.)

Orange County Parks, Newport Beach Arts Foundation, Newport Bay Naturalists & Friends, Southern California Plein Air Painters Association present the show and sale of original artwork of 60 or more artists who will be painting the Upper Newport Bay at various locations during the month of July. 30% of the proceeds go to the Newport Bay Naturalists & Friends.

Bring the whole family and explore the many nature exhibits in the Interpretive Center. Have lunch at our food court and view the Kids Plein Air Painting Exhibition.

More information: Call (949) 640-6712 or visit
www.newportbay.org or www.socalpapa.com

Butterfly Wings (cont.)

tion from predators even if it is not poisonous.

One likely function of wing patterns is to focus the attention of predators towards less critical regions of the body. Butterflies in two separate families - the Swallowtails and Hairstreaks—have taken this strategy to impressive extremes. For example, in the Tiger swallowtail butterfly the yellow and black stripes converge on the tail end of the insect, where it displays both false eyes and false antennae. Often you will find one of these butterflies with a piece missing from the back end; presumably taken by a bird that was taken in by the deception (you never find butterflies with a piece missing from the front end!). Some of the Hairstreak butterflies, of which we have several species, also have lines converging of the tail end where they have both false eyes and false antennae. Some of them enhance the deception by making the false antennae wiggle as they rub their wings together.

Investigating butterfly wings takes us into many directions—about engineering of photonic devices, about visual communication, about attraction, deterrence, mimicry and deception, about self-defense, and about cost-benefit analysis. They have been evolving these devices for many millions of years, and we still have much to learn from them.

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