Mutant Monikers

A tale of freaky flies and gonzo geneticists

By RICK WEISS

It's probably not fair to place all the blame on Thomas Morgan. But in a way it's his fault — or, depending on how you look at it, his most outstanding accomplishment — that mutant fruit flies today bear the strange names they do.

Hedgehog, ether à go-go, shaven baby and killer of prune are among the hundreds of weirdly named mutants that fruit fly geneticists today discuss seriously at scientific meetings.

True, Morgan himself didn't dream up most of these names. Indeed, the late U.S. biologist and 1933 Nobel laureate exhibited reasonable restraint in the way he named genes, waxing poetic at times but rarely venturing into the bizarre. It was his students — and worse, his students' students — who took the art of genetic nomenclature beyond the bounds of scientific reason, and in some cases beyond the limits of good taste.

Still, it was Morgan who nudged the movement into motion by molding the peculiar system of nomenclature that led to what one researcher calls "one of the richest sources of ridiculous names in the world" — names like dunce, tricky dick and technical knockout.

Clearly, Morgan was an eccentric. He regularly ate the remains of sea urchins and other marine organisms he had used in experiments, claiming that "to know your organism, you must eat it." Rumor has it that when his research interests expanded from marine biology to insect genetics at Columbia University, he took to eating fruit fly pupae — the brown, cocoon-enclosed maturing insects — claiming they tasted like Grape Nuts.

Whatever his dietary habits, Morgan probably didn't know just what he was starting back in 1910 when he became the first to identify and name an inherited mutation in a fruit fly. The mutation left the normally red-eyed insects with pure white eyes, and he named the altered gene "white," abbreviating it *w*.

Logical as that decision may seem, Morgan could have done things differently. For example, he could have named the eye-color gene "red," or "eye color," or even "red eye," describing the normal state of affairs. Then he could have added symbolic suffixes or modifiers to describe various mutant forms of that gene, such as "eye^{W}" for the mutation that causes white eyes. Indeed, geneticists working with other organisms have devised gene-name systems along such logical lines.

But for reasons that will remain forever unknown, Morgan chose to emphasize the appearance — or, as geneticists say, the phenotype — of the *mutant* form. And since the number of mutant phenotypes far exceeds that of normal phenotypes (strictly speaking, only one phenotype is "normal"), he threw open the door to a nomenclatural free-for-all that continues to this day. Fruit fly geneticists now rack their brains to think up amusing but descriptive names for the dozens of mutants discovered every year.

"It's a long-standing, whimsical tradition. It has to do with basic craziness," says Thomas C. Kaufman, a fruit fly geneticist at Indiana University in Bloomington who has contributed such esoteric gene names as fushi tatazu. Some scientists have spent months coming up with the perfect name for their mutation, or even longer to find a mutation for a strange name they'd like to use. But not just any clever name will do, Kaufman warns. "To work, it has to have a rationale."

Take, for example, a mutant gene discovered in 1963 by a Yale University researcher named Coolgeer Gill. Male flies bearing this genetic quirk engage in courtship rituals with other male flies instead of with females. Times being what they were, Gill named the gene "fruity," abbreviated as *fru*.

About a decade later, geneticist Jeffrey C. Hall, now at Brandeis University in Waltham, Mass., convinced Gill that changing sensitivities about sexual preference had left the gene's name sounding a bit insulting. They agreed to rename the mutant "fruitless," a politically neutral moniker that accurately describes the fly's inability to sire offspring while keeping the well-known abbreviation *fru*.

Peer pressure played a role in the development of other names, too. Fruit flies, while not brilliant, can be trained to respond in particular ways to certain stimuli such as mild electrical shocks. Years ago, Seymour Benzer at the California Institute of Technology in Pasadena isolated a mutant strain that fails to learn. "It just can't remember anything," Benzer says of the mutant. He identified the responsible gene and named it dunce.

Before long, scientists discovered other learning-impaired mutants. William G. Quinn, for example, now at the Massachusetts Institute of Technology in Cambridge, came up with several dullard mutants and came close to naming them and their mutant genes after famous retarded characters in literature, such as Lenny in Steinbeck's *Of Mice and Men*.

What happened next depends on whom you ask. Several geneticists say colleagues pressured Quinn to avoid the retardation theme, which mental health professionals and their clients might construe as demeaning. Quinn says he changed his mind on his own. In any case, many consider his ultimate decision to name the mutants after vegetables such as rutabaga, turnip and cabbage only marginally more diplomatic.

Marty Chalfie, a geneticist at Columbia University, remembers an even stranger version. "The story I heard," Chalfie says, "was that he was first going to name them after stupid scientists."

Some names become period pieces. In the 1960s, William D. Kaplan, now at the City of Hope Hospital in Duarte, Calif., discovered a mutant fruit fly that twitches and shakes when exposed to ether. "It was a period when everybody was talking about Whiskey à go-go and here was a fly that was doing this sort of dance," Kaplan recalls. "So we decided to name it ether à go-go to celebrate the era when it was discovered."

But Kaplan no longer works with the mutant. It's Barry S. Ganetzky at the University of Wisconsin-Madison who has taken up that particular research gauntlet and who must now live with the name, which some scientists criticize as sounding "dated." Ganetzky admits that he's sometimes embarrassed to talk about the gene, even in fruit fly circles. "I almost never refer to it that way in a seminar," he says. "I always call it *eag*."

Ganetzky says that if he had discovered the gene, he probably would have given it another name. "But to tell you the truth, we have discovered several genes ourselves and given them names that other people probably think are equally stupid." Indeed, Ganetzky confesses to having created a long list of adjectives that would make good names for peculiar but as-yet-undiscovered behavioral mutants.

Perhaps the most famous case of scientists having to stretch their imaginations to incorporate a name they wanted to use comes from the laboratory then headed by David T. Suzuki at the University of British Columbia in Vancouver. In the 1970s, Suzuki promised a hot fudge sun-

dae to the person who suggested the best name for a newly discovered gene that left flies healthy at 22°C but caused partial paralysis and a staggered gait at 29°C. A laboratory technician won the contest by coming up with hot shi^{TS}. Shi is short for the Japanese word shibire, which means in essence "walks like a drunk." TS stands for temperature sensitive, while the prefix hot indicates that the mutant trait emerges only at warmer temperatures.

That's the way it goes sometimes, Kaufman says. "You start with the word you want to use, then you try to think of an excuse so you can get ca-ca humor into the journals." Adds Thomas A. Grigliatti, who was working in the Suzuki lab when hot shi^{TS} was named: "These things happen when people need more sleep than you recognize."

Other bizarre examples abound. A mutation that causes purplish-brown eyes goes by the name prune. A separate mutation that proves lethal only to flies carrying the prune mutation bears the name killer of prune.

Along similar lines, a family of names has sprung up around a mutation called sevenless, which leaves its victims missing the seventh of eight light receptors normally present in a fruit fly's eye. Phenotypically similar mutations now bear names such as bride of sevenless, son of sevenless and sevenless in absentia.

Another mutation, which proves nearly fatal and which, in the words of one researcher, makes flies "look like they have no right to be alive," goes by the name living dead.

Other names relate to the bristle patterns on fruit fly larvae. Hedgehog lacks the bald segments that normally intervene between bristled segments, giving larvae an especially furry appearance, while shaven baby lacks bristles altogether.

The technical knockout gene, commonly called *tko,* leaves fruit flies so exquisitely sensitive to shock that a tap against the walls of their container leaves them flat on their backs and catatonic for a few seconds or longer. And for a fruit fly whose larvae have only half the usual number of segments, there's *fushi* (Japanese for "segment of bamboo") *tatazu* ("not enough").

Finally, students of European history will appreciate Trudi Schupbach's work at Princeton University. Schupbach discovered several mutations that cause flies to bear sterile offspring. She named them after European royal families with sterility problems – such as Tudor, Valois and Vasa – whose reigns were cut short for lack of heirs. And in an elegant twist, she gave the name staufen to one of the grandchildless mutants that has an additional inherited defect causing it to lack a proper head – in memory of the infertile Holy Roman Empire family named Staufen whose last surviving member was ultimately beheaded.

Some fruit fly geneticists complain that younger researchers lack the imagination of their predecessors, and that the wild and woolly days of gene naming may be drawing to a close. In the past, says Grigliatti, "people were willing to poke fun at themselves. Now people have begun to name their genes with very serious names. People are much more conservative these days."

Kaufman concurs: "It's degenerating these days. The art is dying, I'm afraid."

Still, others say, there seems something about the field of fruit fly genetics that guarantees a continuing lineage of wackiness. Fruit fly research "bubbles with chaos," says Hall, noting that compared to almost any other field of science, "there's very little orchestration."

Quinn agrees, but says the future of Thomas Morgan's legacy is ensured by more than that. The real reason that fruit fly nomenclatural inaneness remains secure, Quinn maintains, is that most fruit fly geneticists "are not very restrained by the bounds of good taste."

And with that in mind, this story will sidestep any description of a rather peculiar mutant called tricky dick. □

Continued from p.28

link communications between ground stations and most of its Earth-orbiting satellites.

• The Extreme Ultraviolet Explorer satellite (EUVE) will get an August launch from an unmanned Delta rocket. This 2½-year mission aims to make the first sky survey of spectral emissions between ultraviolet light and X-rays. These wavelengths are particularly useful for studying stars that have matured into compact, ultrahot "white dwarfs."

EUVE will carry four telescopes to chart about 95 percent of the sky to an accuracy of 0.1 degree. It will also conduct follow-up observations of particularly interesting extreme-ultraviolet sources and measure the opacity of the interstellar medium.

Engineers designed this satellite so that when its original mission ends, shuttle astronauts can replace its scientific instruments with another batch. This in-orbit substitution will transform EUVE into the X-ray Timing Explorer, a probe to measure fluctuations in the brightness and spectrum of bright X-ray sources for studies of neutron stars and black holes.

• On Oct. 29, the Galileo spacecraft will become the first satellite to closely examine an asteroid. Since its launch on Oct. 18, 1989, Galileo has sped through an intricate route of speed-increasing gravity maneuvers that have already whipped the craft around Venus and Earth. The probe's ultimate goal is to orbit Jupiter in 1995.

On its way, Galileo will pass "minor planet" Gaspra. This rocky asteroid seems unlikely to prove a star of the mission, since the limited spectral measurements available from Earth suggest it is just a chunk of stone some 15 km across. Galileo should whip by Gaspra at a relative top speed of more than 28,800 km per hour, taking pictures and spectral measurements as it passes within 1,600 km of the asteroid's surface.

The spacecraft will continue along a circular route carrying it past Earth again on Dec. 8, 1992. After this second, accelerating rendezvous with its home planet, Galileo will finally head for Jupiter, possibly passing a second asteroid named Ida along the way.

• The protective ozone layer in Earth's upper atmosphere – imperiled by some chemicals including the chlorofluorocarbons – will be the focus of the Upper Atmosphere Research Satellite (UARS), set for release from the shuttle Discovery in November. Expected to operate for three years, UARS will carry nine instruments to compile a planet-wide data base about the chemistry and motions of the upper atmosphere, the effects of the sun's radiation on the upper atmosphere, and changes in the amount and distribution of ozone and other atmospheric gases.

• In December, the shuttle Atlantis will carry the International Microgravity Laboratory aloft to study how the reduced gravity of space affects the properties of different materials and the workings of mechanical devices. NASA hopes the microgravity study will, like Columbia's biomedical mission in May, help write the textbooks for astronauts working on space station Freedom. The European Space Agency, France's National Center of Space Studies, the National Research Council of Canada, Japan's National Space Development Agency and the German Aerospace Research Establishment helped NASA develop the mission.

Scientists continue to await the detection – which may or may not occur this year – of the shock wave formed where the solar wind collides at supersonic speed with a similar flow of charged particles coming in from other stars. The only craft that might do the job are Voyagers 1 and 2 and Pioneers 10 and 11. Launched between 1972 and 1977, all four are now headed away from the sun toward an invisible zone called the heliopause – a region that some scientists define as the true edge of the solar system. □