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of AMD, genetic studies should also provide targets for devising even better therapies.

7 DOWN THE BIODIVERSITY ROAD. It doesn't take much to send an organism down speciation's path. Several studies these past 12 months have uncovered genetic changes that nudge a group of individuals toward becoming a separate species by giving them an edge in a new environment. The year's results speak to the power of genomics in helping evolutionary biologists understand one of biology's most fundamental questions: how biodiversity comes about.

For Florida beach mice, a single base difference in the melanocortin-1 receptor gene accounts for up to 36% of the lighter coat color that distinguishes the beach mice, evolutionary biologists reported in July. For cactus finches, the activity of the calmodulin gene is upregulated, causing their relatively long beaks, researchers reported in August.

Genes help drive speciation in other ways as well. Since the late 1930s, researchers have realized that as two incipient species diverge, the sequences of two or more interacting genes can evolve along different paths until the proteins they encode no longer work together in any crossbred offspring. Working with *Drosophila melanogaster* and a sister species, *D. simulans*, evolutionary geneticists have pinpointed the first such pair of incompatible genes, demonstrating in transgenic flies the genes' killing effects in hybrids of the two species. In October, a separate team found another fast-evolving gene and is homing in on its partner. They both seem to be nuclear pore proteins that are no longer compatible in fruit-fly hybrids. In September, fruit-fly researchers found that hybrids had problems because a particular gene was in a different place in the two species, likely because of duplication and loss of the original copy in one of them.

But in at least one case, hybrids do just fine. In June, evolutionary biologists detailed the most convincing case yet of a species that arose through hybridization. They bred two species of passion vine butterflies and got the red and yellow stripe pattern of a third species (image above). The pattern proved unattractive to the parent species, helping to reproductively isolate the hybrid.

Breakdown of the Year: Scientific Fraud

One year ago, as *Science* was assembling its 2005 Breakthrough of the Year issue, the need for a last-minute change became uncomfortably clear. A shadow was creeping across one of this journal's landmark papers, in which a team of South Korean and American researchers, led by Woo Suk Hwang at Seoul National University, claimed to have created the first-ever human embryonic stem cell lines that matched the DNA of patients. After anonymous allegations of irregularities in that paper appeared on a Korean Web site, South Korean authorities launched an investigation. As the story unfolded, *Science*'s news editors hastily pulled an item about the Hwang achievements from the issue's roster of runners-up.

Today, the fallout from the Hwang case is plain. Multiple inquiries discredited two papers Hwang published in *Science* in 2004 and 2005, which claimed some of the greatest accomplishments to date with human embryonic stem cells. The papers were retracted. But the scientific fraud, one of the most audacious ever committed, shattered the trust of many researchers and members of the public in scientific journals' ability to catch instances of deliberate deception.

As it turned out, the Hwang debacle marked the beginning of a bad year for honest science. Incidents of publication fraud, if not on the rise, are garnering more attention, and the review process is under scrutiny. In June, European investigators reported that the bulk of papers by Jon Sudbø, formerly a cancer researcher at the Norwegian Radium Hospital in Oslo, contained bogus data. Those included two articles in *The New England Journal of Medicine* that described a new way of identifying people at high risk of oral cancer, a strategy that many clinicians were keen to apply to patients.

Busted. The unraveling of Hwang's stem-cell papers was the first and worst of the year's research scandals.

Eric Poehlman, formerly a menopause and obesity researcher at the University of Vermont in Burlington, garnered perhaps the most dubious distinction of all: He became the first researcher in the United States to go to jail for scientific misconduct unrelated to patient deaths.

The Hwang case, however, was unique for its combustible mix of startling achievements in a high-profile field and publication in a high-visibility journal. Manipulated images, purportedly of distinct stem cells matched to patients but in fact showing cells drawn from fertilized embryos, handily fooled outside reviewers and *Science*'s own editors. "The reporting of scientific results is based on trust," wrote Editor-in-Chief Donald Kennedy in a January 2006 editorial explaining why journals are not designed to catch fraud. It's a comment echoed often by journal editors facing the nightmare of faked data in their own pages.

But the shock of the Hwang deception, along with other recent fraud cases, is jolting journals into a new reality. Five scientists and a top editor of *Nature* examined *Science*'s handling of the Hwang papers, at the journal's request. Their report, published on *Science*'s Web site earlier this month (www.sciencemag.org/sciext/hwang2005), concluded that operating in an atmosphere of trust is no longer sufficient. "*Science* must institutionalize a healthy level of concern in dealing with papers," the group wrote. It recommended "substantially stricter" requirements for reporting primary data and a risk assessment for accepted papers. *Science* and some other journals are also beginning to scrutinize images in certain papers, in an effort to catch any that have been manipulated.

Stem cell researchers, meanwhile, endured deep disappointment as a remarkable scientific advance evaporated before their eyes. Cloning early-stage human embryos, and crafting customized stem cell lines, is not the cakewalk some scientists hoped Hwang's papers had shown it to be. Stem cell researchers are backpedaling to more modest goals, just as *Science* and other journals consider how to prevent a breakdown of this magnitude from striking again. **–JENNIFER COUZIN**