WIRED Magazine May 2006

http://www.wired.com/wired/archive/14.05/posts.html?pg=5

accessed online May 8, 2006

Mark of the Beasts

A dead godwit is not much to look at. Scrawny and brown, with too much beak, the bird would not be fit to decorate your grandmother's Sunday hat. Yet I'm feeling slightly giddy in the presence of the specimen **Carla Dove** has just lifted from a drawer. Tied to its feet are several cardboard tags, the oldest of which, dated 1837, bears the handwritten name *Charles Darwin*. "It's the most famous bird in our collection," Dove says, breaking into a proud smile, "the only one in the country shot by Darwin himself."

Dove is a researcher at the Smithsonian Institution, where there's no shortage of feathered celebrities, including the world's last passenger pigeon. In all, between 625,000 and 640,000 specimens occupy the back rooms of the **Smithsonian's Museum of Natural History**. Records - classified using old-fashioned Linnaean systematics - are kept in ledgers and card catalogs. Skins are frequently checked out by researchers, "like library books," Dove says.

This is pretty much the way taxonomy has been practiced since Darwin's day. The number of known species has grown exponentially, yet the work of identifying and classifying them has remained the hands-on domain of specialists like Dove. **But the Smithsonian is becoming the world headquarters of a new kind of taxonomy, accessible to anyone with a DNA sequencer, an Internet connection, and basic computer literacy.**

Only three years old, **the Consortium for the Barcode of Life** has attracted researchers at universities and natural history museums in more than 40 countries. The project's goal is to sequence the same segment of DNA from as many organisms as participants can find. The result will be a "barcode of life" that will uniquely identify each of the 10Â million to 15Â million species - from birds and mammals to cyanobacteria and slime molds - believed to live on Earth.

In 2002, University of Guelph geneticist Paul Hebert settled on a specific 648-base-pair fragment of DNA because, he realized, it had the virtue of varying greatly among species but minimally among the individuals within them. Hebert's segment is a stretch of mitochondrial DNA in subunit I of the cytochrome *c oxidase* gene, already used in isolated classification schemes (such as shrimp taxonomy) but never before tried as a common standard. "The idea of a universal diagnostic has been a holy grail since people began naming species," says David Schindel, who, as executive secretary, oversees the consortium from behind a broad desk at the museum. "But it has proven impossible - until now."

The nuts and bolts of the work fall to Lee Weigt, chief of the Smithsonian's barcode-identification effort. He's busy these days trying to sequence the world's 10,000 or so bird species as part of the project's pilot program. He shows me his latest DNA analysis equipment, installed at a Smithsonian laboratory a short drive from the museum, while talking about price and volume with the precision of a factory manager. "On three machines, we can process 6,000 samples a week for about $2 apiece, but the total cost of the machines is over half a million dollars," he says, taking a quick breath. "Without the high tech robotics, it could cost up to $5 a sample, and you can do only hundreds a week."

With Schindel's leadership and Weigt's savvy, the project will likely extract a barcode from every bird species by its 2010 target date. And a universal barcode of life, at an estimated cost of

$1Â billion, is possible in the next decade. Which raises a host of interesting questions: Will taxonomy become merely a branch of genetics? What will scientists do with the broad surveys of biodiversity made possible by the barcoding project? Will biologists bother going into the field when they can gather so much practical information from a database?

Dove and I look again at Darwin's godwit, as if it might resolve these issues. The barcode starts off like all the others: "CCTATACCTAATCTTCGGCGCATGAGCTGGTATAGT." But the dead bird remains silent.

- Jonathon Keats