

Microscopic Bar Coding

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Bar-coding is a method for identifying a specific object. Similar to the way that items at a supermarket are identified for pricing, this method of identification was first used for the military or railways in order to know locations of boxcars. Since then, this technology has been applied to hospitals, automobile renting, and many other situations as a means of identification.

Currently, scientists are testing ways to apply bar-coding to the macro- and microscopic world. One theory of its uses would be a revolution in the field of taxonomy, or the systematic identification of organisms. Bar coding would be used in order to differentiate between organisms, where the ten million estimated species of animals would be identified by their DNA, rather than just by visual inspection.



Proposing the idea is Professor John Hebert, pictured left, from the Department of Zoology at the University of Guelph, Canada. He believes that the union of “modern technology” and “the task of species recognition” would bring about a system to catalogue the different species of animals even including “possibly all eukaryotes- plants, fungi, and protists.” Considering that of the estimated ten million species, only 1.2 million have yet to be described formally, this classification process will not be easy.

Hebert and his colleagues have begun the testing of this hypothesis. The

realization of this arduous task is quite near and it is believed that an examination of the chemical bases of DNA would yield the necessary amount of bar codes required for such a large scale classification.

The four chemicals that encode DNA, adenine, cytosine, guanine, and thymine are arranged such that the genomes of a given species is millions nucleotides long. Rather than examine an entire genome, one coding gene within the mitochondrial membrane of a cell would suffice. The gene, “Cytochrome c oxidase I” or COI may be the distinguishing factor of one species to the next. Using this gene as the identifying gene, Hebert and his team have experienced 100 percent success in identification of life forms, from flatworms to vertebrates. This is convincing evidence that microscopic bar coding could in fact be the impetus of the classification of all the world’s life forms.

Types of Bar Coding

One type of microscopic bar code is the Glass Ribbon; others include Microscopic Dots, and Microrods. To the right is an example of the Glass Ribbons, only 100 x 20 micrometers in size. Under a microscope, and using a fluorescent light, these Glass Ribbons become visible.



Sources

G.J. “Microscopic Glass Ribbons Provide Molecular Labels.” *Science News* 163.6 (2/8/2003): 1.

http://www.barcodeart.com/art/portrait/bar_code_gates_01.html

<http://pubs.acs.org/cen/topstory/7941/7941notw8.html>

<http://www.nature.com/nsu/010705/010705-4.html>

<http://www.trsa.org/industry/history/0290/code.htm>

<http://www.uoguelph.ca/mediaref/archives/002333.html>