

## A Family Tree in Every Gene

by Armand Marie Leroi

14.03.05. *The New York Times*, p. A23.



London — Shortly after last year's tsunami devastated the lands on the Indian Ocean, *The Times* of India ran an article with this headline: "Tsunami May Have Rendered Threatened Tribes Extinct." The tribes in question were the Onge, Jarawa, Great Andamanese and Sentinelese—all living on the Andaman Islands—and they numbered some 400 people in all. The article, noting that several of the archipelago's islands were low-lying, in the direct path of the wave, and that casualties were expected to be high, said, "Some beads may have just gone missing from the Emerald Necklace of India."

The metaphor is as colorful as it is well intentioned. But what exactly does it mean? After all, in a catastrophe that cost more than 150,000 lives, why should the survival of a few hundred

tribal people have any special claim on our attention? There are several possible answers to this question. The people of the Andamans have a unique way of life. True, their material culture does not extend beyond a few simple tools, and their visual art is confined to a few geometrical motifs, but they are hunter-gatherers and so a rarity in the modern world. Linguists, too, find them interesting since they collectively speak three languages seemingly unrelated to any others. But *The Times* of India took a slightly different tack. These tribes are special, it said, because they are of "Negrito racial stocks" that are "remnants of the oldest human populations of Asia and Australia."

It's an old-fashioned, even Victorian, sentiment. Who speaks of "racial stocks" anymore? After all, to do so would be to speak of something that many scientists and scholars say does not exist. If modern anthropologists mention the concept of race, it is invariably only to warn against and dismiss it. Likewise many geneticists. "Race is social concept, not a scientific one," according to Dr. Craig Venter—and he should know, since he was first to sequence the human genome. The idea that human races are only social constructs has been the consensus for at least 30 years.

But now, perhaps, that is about to change. Last fall, the prestigious journal *Nature Genetics* devoted a large supplement to the question of whether human races exist and, if so, what they mean. The journal did this in part because various American health agencies are making race an important part of their policies to best protect the public—often over the

protests of scientists. In the supplement, some two dozen geneticists offered their views. Beneath the jargon, cautious phrases and academic courtesies, one thing was clear: the consensus about social constructs was unraveling. Some even argued that, looked at the right way, genetic data show that races clearly do exist.

The dominance of the social construct theory can be traced to a 1972 article by Dr. Richard Lewontin, a Harvard geneticist, who wrote that most human genetic variation can be found within any given "race." If one looked at genes rather than faces, he claimed, the difference between an African and a European would be scarcely greater than the difference between any two Europeans. A few years later he wrote that the continued popularity of race as an idea was an "indication of the power of socioeconomically based ideology over the supposed objectivity of knowledge." Most scientists are thoughtful, liberal-minded and socially aware people. It was just what they wanted to hear.

Three decades later, it seems that Dr. Lewontin's facts were correct, and have been abundantly confirmed by ever better techniques of detecting genetic variety. His reasoning, however, was wrong. His error was an elementary one, but such was the appeal of his argument that it was only a couple of years ago that a Cambridge University statistician, A. W. F. Edwards, put his finger on it.

The error is easily illustrated. If one were asked to judge the ancestry of 100 New Yorkers, one could look at the color of their skin. That would do much to single out the Europeans, but little to distinguish the Senegalese from the Solomon Islanders. The same is true for any other feature of our bodies. The shapes of our eyes, noses and skulls; the color of our eyes and our hair; the heaviness, height and hairiness of our bodies are all, individually, poor guides to ancestry.

But this is not true when the features are taken together. Certain skin colors tend to go with certain kinds of eyes, noses, skulls and bodies. When we glance at a stranger's face we use those associations to infer what continent, or even what country, he or his ancestors came from—and we usually get it right. To put it more abstractly, human physical variation is correlated; and correlations contain information.

Genetic variants that aren't written on our faces, but that can be detected only in the genome, show similar correlations. It is these correlations that Dr. Lewontin seems to have ignored. In essence, he looked at one gene at a time and failed to see races. But if many—a few hundred—variable genes are considered simultaneously, then it is very easy to do so. Indeed, a 2002 study by scientists at the University of Southern California and Stanford showed that if a sample of people from around the world are sorted by computer into five groups on the basis of genetic similarity, the groups that emerge are native to Europe, East Asia, Africa, America and Australasia—more or less the major races of traditional anthropology.

One of the minor pleasures of this discovery is a new kind of genealogy. Today it is easy to find out where your ancestors came from—or even when they came, as with so many of us, from several different places. If you want to know what fraction of your genes are

African, European or East Asian, all it takes is a mouth swab, a postage stamp and \$400—though prices will certainly fall.

Yet there is nothing very fundamental about the concept of the major continental races; they're just the easiest way to divide things up. Study enough genes in enough people and one could sort the world's population into 10, 100, perhaps 1,000 groups, each located somewhere on the map. This has not yet been done with any precision, but it will be. Soon it may be possible to identify your ancestors not merely as African or European, but Ibo or Yoruba, perhaps even Celt or Castilian, or all of the above.

The identification of racial origins is not a search for purity. The human species is irredeemably promiscuous. We have always seduced or coerced our neighbors even when they have a foreign look about them and we don't understand a word. If Hispanics, for example, are composed of a recent and evolving blend of European, American Indian and African genes, then the Uighurs of Central Asia can be seen as a 3,000-year-old mix of West European and East Asian genes. Even homogenous groups like native Swedes bear the genetic imprint of successive nameless migrations.

Some critics believe that these ambiguities render the very notion of race worthless. I disagree. The physical topography of our world cannot be accurately described in words. To navigate it, you need a map with elevations, contour lines and reference grids. But it is hard to talk in numbers, and so we give the world's more prominent features—the mountain ranges and plateaus and plains—names. We do so despite the inherent ambiguity of words. The Pennines of northern England are about one-tenth as high and long as the Himalayas, yet both are intelligibly described as mountain ranges.

So, too, it is with the genetic topography of our species. The billion or so of the world's people of largely European descent have a set of genetic variants in common that are collectively rare in everyone else; they are a race. At a smaller scale, three million Basques do as well; so they are a race as well. Race is merely a shorthand that enables us to speak sensibly, though with no great precision, about genetic rather than cultural or political differences.

But it is a shorthand that seems to be needed. One of the more painful spectacles of modern science is that of human geneticists piously disavowing the existence of races even as they investigate the genetic relationships between "ethnic groups." Given the problematic, even vicious, history of the word "race," the use of euphemisms is understandable. But it hardly aids understanding, for the term "ethnic group" conflates all the possible ways in which people differ from each other.

Indeed, the recognition that races are real should have several benefits. To begin with, it would remove the disjunction in which the government and public alike defiantly embrace categories that many, perhaps most, scholars and scientists say do not exist.

Second, the recognition of race may improve medical care. Different races are prone to different diseases. The risk that an African-American man will be afflicted with hypertensive heart disease or prostate cancer is nearly three times greater than that for a

European-American man. On the other hand, the former's risk of multiple sclerosis is only half as great. Such differences could be due to socioeconomic factors. Even so, geneticists have started searching for racial differences in the frequencies of genetic variants that cause diseases. They seem to be finding them.

Race can also affect treatment. African-Americans respond poorly to some of the main drugs used to treat heart conditions—notably beta blockers and angiotensin-converting enzyme inhibitors. Pharmaceutical corporations are paying attention. Many new drugs now come labeled with warnings that they may not work in some ethnic or racial groups. Here, as so often, the mere prospect of litigation has concentrated minds.

Such differences are, of course, just differences in average. Everyone agrees that race is a crude way of predicting who gets some disease or responds to some treatment. Ideally, we would all have our genomes sequenced before swallowing so much as an aspirin. Yet until that is technically feasible, we can expect racial classifications to play an increasing part in health care.

The argument for the importance of race, however, does not rest purely on utilitarian grounds. There is also an aesthetic factor. We are a physically variable species. Yet for all the triumphs of modern genetics, we know next to nothing about what makes us so. We do not know why some people have prominent rather than flat noses, round rather than pointed skulls, wide rather than narrow faces, straight rather than curly hair. We do not know what makes blue eyes blue.

One way to find out would be to study people of mixed race ancestry. In part, this is because racial differences in looks are the most striking that we see. But there is also a more subtle technical reason. When geneticists map genes, they rely on the fact that they can follow our ancestors' chromosomes as they get passed from one generation to the next, dividing and mixing in unpredictable combinations. That, it turns out, is much easier to do in people whose ancestors came from very different places.

The technique is called admixture mapping. Developed to find the genes responsible for racial differences in inherited disease, it is only just moving from theory to application. But through it, we may be able to write the genetic recipe for the fair hair of a Norwegian, the black-verging-on-purple skin of a Solomon Islander, the flat face of an Inuit, and the curved eyelid of a Han Chinese. We shall no longer gawp ignorantly at the gallery; we shall be able to name the painters.

There is a final reason race matters. It gives us reason—if there were not reason enough already—to value and protect some of the world's most obscure and marginalized people. When *The Times* of India article referred to the Andaman Islanders as being of ancient Negrito racial stock, the terminology was correct. Negrito is the name given by anthropologists to a people who once lived throughout Southeast Asia. They are very small, very dark, and have peppercorn hair. They look like African pygmies who have wandered away from Congo's jungles to take up life on a tropical isle. But they are not.

The latest genetic data suggest that the Negritos are descended from the first modern humans to have invaded Asia, some 100,000 years ago. In time they were overrun or absorbed by waves of Neolithic agriculturalists, and later nearly wiped out by British, Spanish and Indian colonialists. Now they are confined to the Malay Peninsula, a few islands in the Philippines and the Andamans.

Happily, most of the Andamans' Negritos seem to have survived December's tsunami. The fate of one tribe, the Sentinelese, remains uncertain, but an Indian coast guard helicopter sent to check up on them came under bow and arrow attack, which is heartening. Even so, Negrito populations, wherever they are, are so small, isolated and impoverished that it seems certain that they will eventually disappear.

Yet even after they have gone, the genetic variants that defined the Negritos will remain, albeit scattered, in the people who inhabit the littoral of the Bay of Bengal and the South China Sea. They will remain visible in the unusually dark skin of some Indonesians, the unusually curly hair of some Sri Lankans, the unusually slight frames of some Filipinos. But the unique combination of genes that makes the Negritos so distinctive, and that took tens of thousands of years to evolve, will have disappeared. A human race will have gone extinct, and the human species will be the poorer for it.

© 2005 The New York Times Company

\*Armand Marie Leroi, an evolutionary developmental biologist at Imperial College in London, is the author of *Mutants: On Genetic Variety and the Human Body*.

*Posted: April 20, 2005*